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DIVISION OF ENTOMOLOGY VOL. II [BULLETINS II-V]

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EXPERIMENT STATION

HAWAIIAN SUGAR PLANTERS' ASSOCIATION

INDEX

HONOLULU, HAWAII
MARCH 19, 1908

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ERRATA.

The following corrections are necessary in my papers on Dryinidae:

Bull. I, p. 39, 40.

The genera *Haplogonatopus* and *Paragonatopus* must be transposed, otherwise the word "preceding" in the generic characters will lead to serious error.

Bull. IV, p. 9.

Line 1 & 2. *"mimus"* and *"mimoides"* belong to *Neogonatopus* on the preceding page.

In table of Dryinidae under heading 3 after "beneath", insert "or at least with a row of well-developed sublamellate denticles".

Headings 10 and 11 should read:

10 (11) Pronotum divided by a distinct transverse impression.....
. . . . . *Paragonatopus.*

11 (10) Pronotum not so divided ..... *Haplogonatopus.*

Bull. IV, p. 14, line 15; for "distinct spinules not lamellate" read "distinct sublamellate denticles."

R. C. L. P.

GENERAL INDEX

KIRKALDY, G. W.: "Leafhoppers-Supplement," Bull. III. pp. I-186, & i-iii, Plates I-XX, textfigs. 1-3. (Sept. 2, 1907).
id. "Leafhoppers" Bull. IV. pp. 60-6. (May 1, 1907).

MUIR, F.: "Notes on some Fijian Insects," Bull. II. pp. I-11, Plate I. (Nov. 10, 1906).

PERKINS, R. C. L.: "Parasites of Leafhoppers," Bull. IV. pp. I-59. (May 1, 1907).

SWEZEY, O. H.: "The Sugar Cane Leaf-Roller (*Omiodes accepta*) with an account of allied species and natural enemies," Bull. V. pp. I-60 & i, Plates I-VI, textfigs. I-3. (Aug. 20, 1907).

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DIVISION OF ENTOMOLOGY BULLETIN No. 2

REPORT OF WORK

OF THE

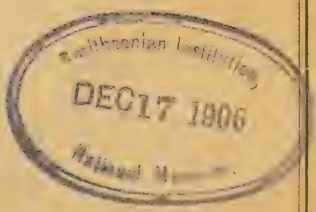
EXPERIMENT STATION

OF THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION

Notes on Some Fijian Insects.

BY F. MUIR



HONOLULU, H. T.
NOV. 10, 1906

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HONOLULU, H. T
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LETTER OF TRANSMITTAL.

To the Committee on Experiment Station,
H. S. P. A., Honolulu, T. H.

Gentlemen:

I, herewith, submit for publication Bulletin II of the Division of Entomology. It is entitled "Notes on some Fijian Insects," and was written by Mr. F. Muir, on his return from Fiji.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., October 11th, 1906.

GENERAL ACCOUNT OF MISSION TO FIJI.

The primary object of my visit to Fiji being the investigation of the economic conditions of Leaf-hopper in the sugar-cane fields, I found that I could not make Suva my headquarters as the nearest sugar plantation was some twelve miles away, so I moved up to Rewa.

In January, 1906, I visited Ba, on the northern side of the island, and in February spent a few days at Navua, on the south-west side. Rewa and Navua are "wet" districts with a rainfall from 110 to 130 inches per year, whilst Ba is dry. I arrived in Fiji at the end of one of the worst droughts that Fijians could remember, the northern side of the island being very dry; but the drought broke in January and during the latter part of my stay collecting was difficult on account of heavy rains and breeding insects was made nearly impossible on account of mould induced by the excessively damp weather.

The Fijian sugar cane leaf-hopper (*Perkinsiella vitiensis*) I found all over the island, but it does no damage, being kept in check by several natural enemies.

The most important of these are the egg-parasites, *Ootetrastichus, Anagrus* and *Paranagrus*. The first of these was introduced from Fiji into Hawaii by Mr. Koebele, and the other two appear to me the same as the Queensland species. In some fields as many as 90% of the hopper eggs were parasitized, but in other fields it was lower. Observations extending over my six months' stay, and made at the various parts of the island visited, show that an average of 85% of hopper eggs were destroyed by these parasites. These figures are only approximate, as I have to estimate that one Chalcid (*Ootetrastichus*) destroys four hopper eggs, which is a low estimate. This Chalcid is more numerous, and on account of destroying the whole batch of hopper eggs, is of very much higher economic value than the Mymarids.

As these parasites had already been introduced in Hawaii, I did not lay myself out to send more, but only sent them along with other insects as opportunity offered.

The parasite next in economic value is a Stylopid (*Elenchus tenuicornis*). This I found attacking young and adults on all the plantations I visited. In one field of cane about ten to twelve

months old, as many as 70% of the hoppers were stylopized, but the true average must be higher, as many of the unstylopized hoppers would develop parasites later.

I made every effort to introduce this into Honolulu and sent five cages of stylopized hoppers to Honolulu. Whether they will attack * *P. saccharicida* or not remains to be seen.

Owing to our ignorance of the habits of these insects, especially in the early stage, they were exceedingly difficult to handle.

A species of *Gonatopus* was also found attacking *P. vitiensis*, especially on the northern, or dry, side of the island. Several consignments of this insect were forwarded, some in cold storage and some in cages on living cane. Although it was nowhere abundant, young hoppers being scarce, yet I hope it will prove of value if once established here.

These were the only parasites I could find upon *P. vitiensis*, the predators being somewhat similar to those in the Hawaiian Islands. Spiders of several species, earwigs and ladybirds, predominate.

Of the ladybirds, *Verania strigula* was most frequently found in sugar-cane fields, and I forwarded several boxes to Honolulu. In captivity it fed upon young *P. vitiensis*. *Anisorcus affinis* I never found in cane-fields, but as it is a most useful enemy of scale (*Chionaspis*), I forwarded several packages. It is not a hardy insect and soon dies in captivity. A large yellow ladybird, *Archaioneda tricolor*, var. *vitiensis*, I also sent, as it ravenously devoured aphis and also a white scale.

A great deal of time was spent in investigating the cane borer (*Sphenophorus obscurus*) to find out what was responsible for its decrease. Thanks to the kindness of Mr. Fenner, of the Colonial Sugar Refining Company, and individual planters on the Rewa, I was enabled to open hundreds of bored stems and stools, but I failed to find any parasites on egg, larva, pupa or adult, or to find any reason why this beetle has decreased since Mr. Koebele visited Fiji in 1892. A fungus kills a small number of pupae, but it is rare. The borer is still numerous and in places much worse than I observed it on the plantations most affected on Oahu.

The introduction of a harder variety of cane is believed, by the majority of Fijian planters, to be the chief reason of the decrease; but if this be so, it took some time to be apparent, as the hard varieties were introduced some time before the borer was noticed to have decreased. With the hard varieties of cane it would take the young larva longer to entirely conceal itself in the cane,

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* As stated below in this Bulletin, it was found that they would not do so.

and thus it would be exposed to the attacks of ants for a longer period. Ants are abundant and in wet fields make their nests between the leaf and the stem of the cane. It is interesting to note that with the reintroduction of soft varieties of cane the borer is apparently on the increase, or at least its attacks are more severe.

I examined the Pandanus palms, cocoanut palms and other native trees, in which this beetle lives, but was unsuccessful in my search for parasites.

Aleyrodes bergii was very abundant in some fields, a fungus being the chief agent in its destruction. Fungi I found to be one of the chief factors in destroying many noxious insects, especially scale.

Such time as I could spare from breeding and shipping insects, I devoted to a general collection, especially of economic insects, which I trust will be of interest when worked out.

A species of slug, a *Vaginula,* very similar to the one found in the Hawaiian Islands, has been a garden pest for several years in Fiji, but, until this year, it was never known to attack sugar-cane. This year it attacked some fields of young seed cane, eating the leaves and destroying the eyes and a great deal of replanting had to be done in these fields in consequence.

The increase of these slugs in sugar cane fields I attribute to the use of "Mauritius bean" as a green manure. These slugs are very fond of this plant for food, and the shade of its leaves makes an attractive breeding ground. When the plant is ploughed in, only a few of the slugs are killed and hundreds of eggs are left to hatch out. The young slugs, finding no other food but sugar cane, attack the young shoots and eyes.

Should "Mauritius bean" be used in the wet districts of the Hawaiian Islands as a green manure, watch should be kept upon the local species of *Vaginula* to see if it increases in the cane fields. Leaving a row of Mauritius beans every two chains or so, until such time as the young cane is beyond attack, might be beneficial.

Lantana is very abundant around Suva, but it does not appear to grow so luxuriantly as in the Hawaiian Islands, though another plant, locally known as "Koester's curse" (*Clidemia hirta*) is very bad in the Rewa district, overrunning all grazing lands.

As an illustration of the manner in which insects can be imported into a country, in spite of every precaution taken by inspectors and custom authorities, I may mention a case that came under my observation on board R. M. S. "Maheno" on my return passage. A passenger bought two or three stalks of cane in Suva and stored them in the alley-way on board. Two days after leaving Suva I took three adult Fijian cane leaf hoppers (*P. vitiensis*) off them, two females and one male; during the

next two or three days several young hoppers hatched out. The day before arriving at Honolulu I stripped the few remaining leaves off the cane and found two more young hoppers.

My work in Fiji was greatly facilitated by the kindness of Mr. F. W. Fenner, Manager of the Colonial Sugar Refining Company, Nausori, Mr. Fordham Jonson of the Vancouver Fiji Sugar Company, and members of the Fijian Planters' Association, especially Mr. J. L. Hunt, of Koronoveh, in whose fields I did most of my collecting. Mr. Duncan, Manager of the Canadian-Australian S. S. Mail Co., kindly gave me every facility for shipping insects to Honolulu.

NOTES ON STYLOPID AND DIPTEROUS PARASITES IN FIJI.

(1) *ELENCHUS TENUICORNIS.*

This insect I found in Fiji parasitic upon the Vitian cane leaf hopper (*Perkinsiella vitiensis*) and several other species of Delphacids. Its economic value I estimated highly, as a large percentage of young and adult leaf hoppers were stylopized. I therefore made great efforts to introduce it, hoping that, as its hosts were so varied, it would attach itself to the Hawaiian cane leaf hopper (*P. saccharicida*). This hope was not fulfilled, as *P. saccharicida* proved immune from the attacks of *Elenchus.* Two or three generations of *Elenchus* were reared upon *P. vitiensis* in cages containing also *P. saccharicida,* and stylopized *Aloha ipomoeae* were enclosed with the latter, but these never developed parasites. Eventually I dissected a great number of *P. saccharicida,* that died in the breeding cages, and in two I found single specimens of triungulins that had never developed. This indicates that a great pathological difference exists between *P. saccharicida* and *P. vitiensis,* a difference that would not be expected from the similarity of their external characters. Mr. G. W. Kirkaldy, however, informs me that the males of these leaf-hoppers differ greatly in the form of their genitalia.

As it was necessary, when in Fiji, to get together as large colonies as possible for shipping to Honolulu, I could not destroy living hoppers for dissection and follow the larval changes as closely as I wished.

Upon my return to Honolulu I was informed by Mr. W. M. Giffard, that he had discovered *E. tenuicornis,* parasitic upon *Aloha ipomoeae,* at an elevation of 1300 feet on Mount Tantalus. He kindly procured me some fresh specimens, which enabled me to verify several points in the economy of these little insects.

It should be noted that Mr. A. Koebele introduced an American *Elenchus* into the Hawaiian Islands in 1903, which failed to establish itself upon *P. saccharicida*. Evidently it took to *A. ipomoeae* for I cannot believe that this parasite existed in the islands prior to that date, or Messrs. Perkins and Giffard would have detected it when collecting on Tantalus.

In the breeding jars the adult males hatched out in the early morning, between sunrise and 7 a. m., and were dead before midday. They are very feeble upon their legs and keep their wings in rapid vibration all the time they are walking. When on the wing they take up a perpendicular position with their antennae erect, and the tip of their abdomen turned slightly under. In this position they hover very steadily around the sugar-cane stalks and along the leaves, seeking leaf hoppers bearing female *Elenchus*. Sight seems to be the chief sense by which they detect the presence of the leaf hoppers, as I have seen one hovering along one side of a leaf with half a dozen stylopized hoppers on the other side, only a quarter of an inch away, and apparently not knowing of their presence, but should a hopper but show its antennae over the edge of the leaf the *Elenchus* darts towards it and hovers over its back. If the hopper bears a mature female parasite, the male settles about half an inch away and crawls towards the hopper, vibrating its wings all the time. This generally disturbs the hopper and it moves off, the *Elenchus* following till it gets a chance to spring upon its back and attach itself to the female. This action disturbs the hopper and it flicks its abdomen to shake off the parasite. Except on these occasions, the hopper appears to have no antipathy towards *Elenchus* and is never disturbed by its presence, as *Polistes* is reported to be by *Xenos*. I have never seen the male *Elenchus* retain its hold of the female for more than six seconds, generally it is attached only two or three seconds. I am unable to say if fecundation takes place during this time or exactly how copulation takes place; evidently the tip of the abdomen is inserted into the brood-chamber.

In captivity the larvae of the first stage, triungulins, never lived longer than twenty-four hours, numbers being drowned in the moisture upon the glass sides of the breeding jars; moisture upon the leaves does not appear to have such a fatal effect upon them. No doubt under more favorable conditions in the open air the triungulins are able to exist for a much longer period before entering their hosts.

The method by which the triungulins enter their hosts I was not able to observe. When they have entered their host and embedded themselves among the fat bodies of the abdomen or thorax they begin to swell and histolysis sets up, the skin splits along

the back and a legless grub emerges. The larva at this, second, stage, is like a small sack filled with a creamy substance that reminds one of the pronymph of Muscids; it is thicker at the anterior end, has no trace of legs or ventral protuberances and no visible trophi. The alimentary tract can be distinguished as a fine tube, but I have been unable to trace it to an anterior or posterior opening; it is apparently functionless and nourishment is obtained through the hypodermis. Two dark pigmented spots are visible below the surface from which the imaginal eyes eventually arise.

The size to which the larva grows depends upon the amount of space and food it receives. One female, the only parasite in a female *P. vitiensis,* filled the entire abdominal and thoracic cavity. Generally there are several parasites in the same host, one containing as many as fourteen of various sizes. As the male larva increases in size, the integument becomes slightly chitinized and the mouth parts became visible. In the next larval stage that I have been able to trace, which I will term the third, the anterior end is greatly constricted and the form similar to the puparium. The imaginal eyes are greatly advanced and the imaginal discs of the thoracic appendages distinguishable. Two larvae at this stage had the mouth parts so very distinct that I doubted if they could be *E. tenuicornis,* but as during my six months' stay in Fiji I found only two parasites upon the adult or larval *P. vitiensis,* I am forced to believe that they are a larval form of this Stylopid. These are figured in Figs. 1, 2 and 3 and explain the mouth parts visible on the head-cap of the male puparium (Fig. 4).

The puparium (Fig. 5) is homologous to that of Muscids, being the skin of the instar preceding the pupal stage, whether that instar be called larval, pseudo-pupal or coarctate-larval. A skin is often found attached to the posterior end of the puparium showing that an ecdysis takes place at that stage.

All the cephalic and thoracic appendages of the adult can be distinguished in the pupa before the anterior end of the puparium is pushed through the pleura of the host.

Across the dorsal surface of the cephalic cap of the male puparium, below the labium, runs a depression, the segmental division between the head and prothorax (Fig. 4). In the female a folding back of the labium and adjoining parts forms an opening at this spot leading to the brood-chamber (Fig. 6).

At an early stage before the apical cap of the puparium is exerted, this segmental depression is distinct all round and the prothoracic spiracles are plainly visible; thus we see that the earlier writers were correct in calling the exserted part of the

insect the cephalothorax. In *Xenos* the opening of the brood-chamber appears to be anterior to that in *Elenchus*. This appearance is evidently due to the flattening of the cephalothorax and forward growth of the prothorax.

The female larva in the second stage can be distinguished, whilst still very small, by the presence of what Brues terms the primitive eggs, at first indefinite areas along the back, but eventually becoming scattered about among the fatbodies. The head of the adult female never leaves the apical cap of the puparium, but the abdomen, distended to an enormous extent by the number of eggs, bursts through the dorsal side of the puparium. The skin of the puparium remains attached to the ventral side of the insect and forms the brood-chamber (Fig. 7). Three ducts open into the brood-chamber, through which I have found triungulins issuing (Fig. 8). Through one or more of these ducts fecundation must take place, but as the eggs all develop simultaneously the spermatozoa must become dispersed among the fatbodies.

The cephalic cap of the female and male puparium are homologous. In the female the labium and other mouth parts are turned under at an acute angle, leaving a hole which forms the entrance to the brood-chamber. At each side of this hole the prothoracic stigmata are visible.

I have not been able to dissect the adult female *Elenchus* free from the cephalic cap, but in a species of *Xenos*, attacking a species of *Polistes* in Honolulu, I have dissected the adult female free from the puparium. It can then be seen that the mouth parts are more like those of the male larva than of the adult male; and we might say that the female development is arrested at the larval or perhaps pupal stage. The female head when dissected out from the apical cap is interesting, as it tends to confirm Dr. R. C. L. Perkins' interpretation of the position of the mouth opening of the male.

The fact that histolysis reduces the muscular system of *Elenchus* larvae more thoroughly than in any other genus of Stylopidae, that the female is less differentiated, that the male antennae are reduced to two branches, its tarsi to two joints, indicates that this genus is the most specialized of the Stylopidae.

Opinions differ as to the effect of stylopization on the host. Dr. R. C. L. Perkins gave me a dissection of a *Polistes* bearing two full grown female *Xenos* and several larvae, in which the internal organs of the *Polistes* were in perfect condition. In the case of the Vitian leaf hopper stylopization had a very harmful effect. The host only lived a short time after a male *Elenchus* hatched out or the young left the brood-chamber of the female. A stylopized female hopper seldom could produce eggs on account

of the damage to her ovarian tubes. Over thirty per cent. of *P. vitiensis* were stylopized, and quite forty per cent. of the parasites were males.

(2) *PIPUNCULUS.*

The parasitic flies of the genus *Pipunculus* appear to be very scarce in Fiji, as compared with Australia, where Koebele and Perkins found them abundantly in all localities. The following very distinct new species was, however, obtained:

Pipunculus vitiensis, sp. nov.

Male. Face, frontal triangle and occiput, black with whitish tomentum; sparse near vertex, denser below; antennae yellow with apex bluntly pointed.

Thorax black; mesonotum shining, without tomentum, pleura and metanotum with whitish tomentum; wings clear, iridescent, with dark neuration, stigma yellowish brown, enclosed basally by a strong cross-vein beyond termination of mediastinal vein, posterior cross-vein before the apex of second longitudinal, third costal area longer than fourth; halteres yellow; legs uniformly yellow.

Abdomen yellow, last segment and hypopygium black, sparsely covered with black hairs; basal segment with three or four bristles on each side.

Dried specimens appear to have a black band upon second segment not noticeable in fresh specimens, evidently caused by the dried up viscera.

Length, 3 mm.

Female. Head black; face with whitish tomentum, front with whitish tomentum at base of antennae and along frontal orbits; whitish tomentum very sparse on occiput near vertex; denser below.

Thorax lighter than in male, dorsum more inclined to brown, and pleura yellowish fuscous with whitish tomentum.

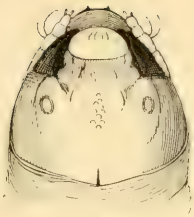
Abdomen and ovipositor yellow, the two posterior tergites fuscous. Length, excluding ovipositor, 2½ mm.

HAB. Rewa, Fiji. A male and female taken together from boughs of trees, so that, like *P. heterostigmus,* it probably attacks arboreal leaf hoppers.

The stigma being enclosed basally by a cross-vein, places this species near *P. heterostigmus,* Perk., but it can be at once distinguished by the shining thorax and yellow legs.

DESCRIPTION OF PLATE NO. I.

1. Head of Elenchus larva, dorsal view.
2. Head of Elenchus larva, front view.
3. Head of Elenchus larva, side view.
4. Cephalothorax or cephalic cap, of male puparium, front view.
5. Male puparium, side view.
6. Cephalothorax of female.
7. Adult female, side view, with puparium skin attached.
8. Longitudinal section through female, diagrammatic.



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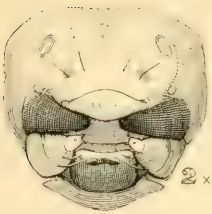

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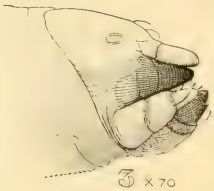

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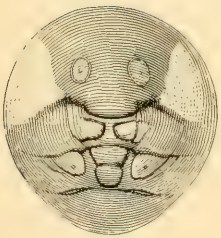

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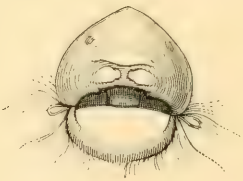

6 x 115

5 x 28

7 x 16

PLATE I.

ALREADY PUBLISHED

Bulletin I.—"Leaf-hoppers and their Natural Enemies," pp. 1-499 + xxxii, with 38 Plates and 10 text figures ..... Price $10.00

DIVISION OF ENTOMOLOGY

BULLETIN NO. III

REPORT OF WORK

OF THE

EXPERIMENT STATION

OF THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION

Leaf-Hoppers—Supplement

(HEMIPTERA)

BY G. W. KIRKALDY

HONOLULU, H. T.

SEPTEMBER 2, 1907

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SEPTEMBER, 1907

LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar Planters' Association, Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication Bulletin III of the Division of Entomology. This has been prepared by Mr. G. W. Kirkaldy, and is supplementary to and completes Bulletin I.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., April 29th, 1907.

ADDENDA.

P. 11: *Tartessus iphis* sp. n.
Vulturnus vaecors sp. n.
P. 12: *Siphanta sensilis* sp. n.
Nesopompe (subg. n. of *Cixius*).
Nesochlamys g. n.
N. vitiensis sp. n.
P. 13: A number of spp. of "Delphax" have been misplaced, also *"P" dilpa* should be *"D."*

INTRODUCTION.

In the present memoir, the determination and description of the Leafhoppers collected by Prof. Koebele and Dr. Perkins, and partially discussed in the ninth part of Bulletin 1, are now completed,— together with those found by Mr. Muir in the Fiji Isles, as well as two interesting forms from China.

In the former contribution, 85 genera and 212 species were erected as new, while 58 genera (and subgenera), and 175 species (and varieties) are now added, a total of 143 genera and 387 species, making a considerable increase in our knowledge of Australo-Fijian Leafhoppers, as almost all of the new forms are from these countries. At the same time, it must be insisted that these form but a small proportion of the total Leafhopper Fauna of the Countries mentioned.

The Australasian (*) Region seems to embrace four subregions:

1. The AUSTROMALAYAN (or Papuan), including that of the same name of Wallace, but extending to include the tropical forest of Queensland, New Caledonia and adjacent islands as far as the Fijian Archipelago.
2. The EURONOTIAN (or Bassian), including the Southeastern third of Australia and Tasmania.
3. The MAORIAN, including New Zealand and adjacent islands.
4. The WESTRALIAN, or West Australia.

Nothing is known of the indigenous Hemiptera of Tahiti, Samoa, the Tuamotus, &c., but they are probably a mixture of various faunas. The Hawaiian Archipelago forms an unattached subregion of great antiquity. From the little that is known of them, the Carolines and Marshalls and perhaps the Mariannes, belong to the Austromalayan.

* I prefer this name of Huxley's to the usual "Australian" of authors. It is very confusing to term the whole Region 'Australian,' as one can then not understand readily whether the mainland, or the region as a whole, is intended.

I think therefore that Wallace's "Polynesian" Subregion should be rejected.

Celebes is usually included in the Papuan, but is perhaps, at present, best regarded as an unattached subregion.

The Fijian Isles seem to have a well marked affinity with New Guinea and the neighboring groups, or with the first of the following Australian.

The Australian Continent seems to possess four principal faunas:

1. The tropical forest, an impoverished extension of the Austromalayan, little known, and producing such forms as *Neomelicharia, Aneipo* and some fine Derbidae.
2. Eucalyptus-Forest, characterized by *Eurymela, Eurinopsyche* and *Platybrachys*. This is typical of the Euronotian.
3. Western Australia, which stands apart from the others.
4. Grass-lands and coast lands, probably typical in another way of the Euronotian, and characterized by common-place *Deltocephalus* and *Asiracidae*.

In the habitats, "K" stands for Prof. Koebele, "P" for Dr. Perkins, and "M" for Mr. Muir.

Mr. Muir's researches in Fiji were confined to Viti Levu. *Suva* is on Suva Bay in the Southeastern part; *Navua* on the river of the same name in the South-central; *Rewa*, on the Rewa river, a little east from Suva, and *Ba* (=Mba) on the Ba River in the northwest.

An expression of appreciation is due to Mr. W. E. Chambers, who has enriched this memoir with more than three hundred figures. No work on Hemiptera has previously appeared, in which such careful and detailed drawings of genitalia are given, affording characters which are the final arbiters of "species" in certain groups.

BIOLOGIC NOTES.

Stridulation.

In my first memoir (p. 285) it was stated that though *Perkinsiella saccharicida* had often been heard to stridulate distinctly, by the Entomologists of this Station, researches on the phenomenon had not yet been made

On his return from Fiji, Mr. Muir handed me the following notes, upon which it is scarcely necessary to enlarge:

"One hot, still morning, when collecting in Fiji, my attention was attracted to a small palm, from which a distinct noise of insects stridulating proceeded. I found the underside of the leaves covered with hundreds of a small red leafhopper (*Muiria stridula* Pl. 20 figs. 10-13). Their tegmina and wings were erected above the back and occasionally gave one or two rapid movements; sometimes the abdomen was jerked up and down. I recognized it as similar to one I had taken in Natal some years ago, in which the wings were exceedingly small and used entirely as stridulating organs. Upon examination I found the wings in the present species were likewise used for that purpose. The tegmina are about 6 mill. long, whilst the wings are only half a millimetre, the anal lobe being larger than the rest of the wing, thickened and corrugated on the hind margin of the upper side.

"The costal margin is turned over and catches into a fold along the margin of the tegmina; by this means it moves with the tegmina. The corrugated surface is opposed to the anterior angles of the abdomen where there are several white bristles situated.

"In another, (*Proutista moesta* Pl. 20 figs. 8-9) from Java, the tegmina are about 5½ mill. long and the wings 3 mill., the anal area larger in proportion to the rest of the wing and corrugated on the upper side.

"In another, (*Pyrrhoneura saccharicida* Pl. 20 figs. 6-7), from Fiji, the tegmina are about 4 mill. long and the wings 3 mill. the broad edge of the anal area being corrugated. The corrugations thin out gradually on each side, and one can see that

they are only a prolongation and intensification of the minute corrugations that border the hind margin of the wing from the end of the costal margin to the base of the wing.

"In another, (*Lyricen inthurni*, Pl. 20 figs. 3-5), from Fiji, the proportional size of the tegmina to the wings is more normal, about 7½ to 5½, and the anal areas of the latter are normal, bearing a strongly corrugated patch near the basal edge.

"Upon examining the anal area of the wing of *Perkinsiella saccharicida*, an enlarging of the corrugation along the basal portion of the edge can be seen. I am in doubt if this could be the means by which they produce the sound."

(Pl. 20 figs. 1-2 represents the wings of *Pyrrhoneura citharista*). Mr. Muir, also, before leaving for the Orient, left me some mounts of tegmina and wings, from which Pl. 20 figs. 1-9 have been made.

I have examined a considerable amount of material and find the stridulatory area developed as follows:

In most of the Derbidae and in some Asiracidae, this structure is present, in both sexes. I cannot find it in any other Auchenorhynchi, nor in those Asiracids in which the wings are rudimentary.

Since my last memoir, Froggatt has published "Australian Insects" (1907), in which there are short biologic notes on several Homoptera.

CLASSIFICATION.

I have nothing to add to my general remarks on the distinctness of the Fulgoroidea, and their high place in the system. I think however that the Cicadoidea and Tetigonioidea should be merged, for although the former are less allied to any of the families of the latter, than these are among themselves, yet the general structure is fundamentally similar.

The system of the Auchenorhynchi now adopted is as follows:

Superfam. 1 Cicadoidea
Fam. 1 Cicadidae
Fam. 2 Cercopidae
Subfam. 1 Cercopinae
2 Machaerotinae
Fam. 3 Tetigoniidae (embracing 10 provisional tribes, viz.: Ledrini, Stenocotini, Eurymelini, Phrynomorphini, Eupterygini, Cephalelini, Iassini, Macroceratogoniini, Penthimiini and Tetigoniini).
Fam. 4 Membracidae
Superfam. 2 Fulgoroidea
Fam. 1 Poekillopteridae
Subfam. 1 Lophopinae
Subfam. 2 Tropiduchinae
(Tribes Tropiduchini and Tambiniini)
Subfam. 3 Ricaniinae
(Tribes Ricaniini and Bladinini)
Subfam. 4 Poekillopterinae
(Tribes Poekillopterini and Phalaenomorphini)
Subfam. 5 Tonginae
Fam. 2 Issidae
Subfam. 1 Issinae
(Tribes Caliscelini, Issini)
Subfam. 2 Amphiscepinae
Subfam. 3 Eurybrachyinae
Fam. 3 Tetigometridae
Fam. 4 Fulgoridae

Subfam. 1 Cixiinae
(Tribes Cixiini, Achilini, Dictyophorini)
Subfam. 2 Fulgorinae
(Tribes Fulgorini, Omalocephalini, Aphaenini)
Fam. 5 Asiracidae
Fam. 6 Derbidae
(Tribes Derbini, Nisiini).

This is however merely tentative, as our knowledge of most groups is still extremely superficial, and nothing satisfactory can be done, till the nymphal instars of many species are described and figured.

There is no need to furnish characters again, separating the Fulgoroidea from the Cicadoidea, and the various families, and other divisions, are separated tabularly further on in their several places.

In my horismology, I have substituted "brachial" for "cubital," for the name of the third main vein arising from the apex of the basal cell, as there can be no doubt what "brachial" is, while there is much difference of opinion as to what "cubital" is. Melichar for instance, terming "cubital" what I call "basal stem of the radiomedian."

LIST OF SPECIES.

The following are the new or notable genera and species etc., described in the following pages: (*) signifies that the nymphs are noted or figured.)

Fam. Cicadidae.
Cicadetta tympanistria, sp. n.
Fam. Cercopidae
Nesaphrestes, g. n.
N. dreptias, sp. n. *
N. ptysmatophilus, sp. n.
Nesaphrogeneia, g. n.
N. vitiensis, sp. n.
Fam. Tetigoniidae
Stenocotis dimorpha, sp. n .
S. reticulata, sp. n.
Smicrocotis sidnica, sp. n.
Eogypona *
Rhotidus * *stali* (n. n.)
Idiocerus kisseis, sp. n.
I. nymphias, sp. n.
I. oreias, sp. n.
I. orodemnias, sp. n.
I. xantho, sp. n.
I. hylcorais, sp. n.
I. cupido, sp. n.
I. napais, sp. n.
I. aulonias, sp. n.
I. nereias, sp. n.

Eurymelias, g.n. (*hyacinthus*)
Ipo pompais, sp. n.
Macropsis oeroe, sp. n.
M. thymele, sp. n.
M. thyia, sp n.
M. thoantias, sp n.
Alseis, g. n.
A. osborni, sp. n.
Epipsychidion epipyropis
Oncopsis balli, sp. n.
Aceratagallia, g. n. (*sanguinolentus*)
Agalliopsis, g. n. (*novellus*)
Eurinoscopus hamadryas, sp. n.
Hybrasil, g. n.
H. brani, sp. n.
Dryadomorpha lotophagorum, sp. n.
Tortor, g. n.
T. daulias, sp. n. *
Tartessus idyia, sp. n.
T. itonias, sp. n.
T. issa, sp. n.
T. io, sp. n.
T. iambe, sp. n.
T. ianthe, sp. n.
T. ianassa, sp. n.
T. ianeira, sp. n.
T. iokaste, sp. n.
Iberia, g. n. (*bolivari*)
Thymbris, g. n.
T. inachis, sp. n.
T. iphianassa, sp. n.
Putoniessa, g. n.
P. dignissima, sp. n.
Xestocephalus vitiensis, sp. n.
X. pallidiceps, sp. n.
X. p. var.*contortuplicatus*, n.
X. p. var. *decemnotatus*, n.
X. australensis, sp. n.
X. purpurascens, sp. n.
X. sidnicus, sp. n.
Eutettix melaleucae, sp. n.
Deltocephalus lotis, sp. n.
D. polemon, sp. n.
D. histrionicus, sp. n.
D. lucindae, sp. n.
Conosanus chlorippe, sp. n.
C. hospes *
Soracte, g. n.
S. apollonos, sp. n.
Nephotettix eurytus, sp. n.
Limotettix filicicola, sp. n.
L. tachyporias, sp. n.
L. capitatus, sp. n.
Thamnophryne, g. n.
T. nysias, sp. n.
Driotura aristarche, sp. n.
Allygus lotophagorum, sp. n.
Lonatura austrina, sp. n.
Nesosteles dryas, sp. n.
N. aurantiigera, sp. n.
N. phryne, sp. n.
N. chloe, sp. n.
Apheliona, g. n. (*bioculata*)
Cicadula hyadas, sp. n.
C. euryphaessa, sp. n.
C. vitiensis.
Erythroneura sidnica, sp. n.
E. doris, sp. n.
E. lalage, sp. n.
E. leucothoe, sp. n.
E. rewana, sp. n. *
Dialecticopteryx, g. n.
D. australica, sp. n.
Paradorydium brighami, sp. n. (subg. *Deltodorydium*, n.)
P. ovidii, sp. n.
Tharra kalypso, sp. n.
T. ogygia, sp. n.
T. kassiphone, sp. n.
T. nausikaa, sp. n.

T. sp? *
Muirella, g. n.
M. oxyomma, sp. n.
Vulturnus vulturnus
V. voltumna, sp. n.
V. virgidemia, sp. n.
V. vanduzeei, sp. n
V. vultuosus, sp. n.
V. vaedulcis, sp. n. *
V. vappa, sp. n.
Leucopepla, g. n.
(*bituberculata*)
Syringophora, g. n. (*brevis*)
Cymbalopus, g. n.
(*bigibbosa*)
Fam. Membracidae
Zanophara leda, sp. n.
Z. albovittata, sp. n.
Acanthuchus iasis, sp. n.
A. euryone, sp. n.
A. eurynomus, sp. n.
Fam. Pcekillopteridae
Eodryas, g. n. (*melichari*)
Dolia, g. n. (*walkeri*)
Astorga saccharicida *
Siphanta granulicollis
S. acuta *
Thanatochlamys, g. n.
T. tristis, sp. n.
Fam. Issidae
Apsadaropteryx, g. n.
(*elongatulus*)
Phaeopteryx, g. n.
P. sidnicus *
Orinda, g. n. (*lucindae*)
Chlamydopteryx, g. n.
C. eurobium, sp. n.
Tylana dyakana, sp. n.
Fam. Fulgoridae
Oliarus lilinoe, sp. n.
O. tasmani
O. lubra var. *vitiensis* n.
O. saccharicola, sp. n.
O. melanesica, sp. n.
Urvillea, g. n.
Nesocharis, g. n.
N. kalypso, sp. n.
Myndus vitiensis, sp. n .
Leirioessa, g. n.
L. tortricomorpha, sp. n.
L. vitiensis, sp. n.
Leptochlamys, g. n.
L. compressa, sp. n.
Dystheatias, g. n.
D. beecheyi, sp. n.
D. b. var *fuscata*, n.
Australoma, g. n.
A. austrina, sp. n.
Quirosia, g. n.
Q. vitiensis, sp. n.
Thenelia sub. *Nephelia*, n.
F. (*N.*) *bicuncata*, sp. n.
F. (*N*) *tristis*, sp. n.
Callinesia, g. n.
C. pulchra, sp. n.
C. ornata, sp. n.
C. venusta, sp. n.
C. pusilla, sp. n.
Callichlamys, g. n.
C. muiri, sp. n.
C. undulata, sp. n.
Fam. Asiracidae
Ugyops vitiensis, sp. n.
Melanesia, g. n.
M. pacifica, sp. n.
M. p. var *strigata*, n.
Criomorphus australiae, sp. n.
Dicranotropis anderida, sp. n.
D. aristoxenus, sp. n.
D. muiri, sp. n.
Purohita arundinacea
Leimonodite, g. n. (*beckeri*)
Perkinsiella sinensis, sp. n.
P. pseudomaidis *

P. graminicida *
P. saccharicida *
P. vitiensis *
Hadeodelphax persephone, sp. n
H. pluto var. *pallidior*, n.
D. dryope, sp. n.
D. ochrias, sp. n.
D. matanitu, sp. n.
D. disonymos, sp. n.
D. hyas, sp. n.
D. geranor, sp. n.
D. kolophon, sp. n.
D. kaha, sp. n.
D. anemonias, sp. n.
D. pylaon, sp. n.
D. albotristriatus, sp. n.
Tropidocephala dryas, sp. n.
T. hamadryas, sp. n.
Anectopia, g. n.
A. mandane, sp. n.
A. igerna, sp. n.
Haplodelphax, g. n.
H. iuncicola, sp. n.
H. naias, sp. n.
H. euronotianus, sp. n.
Megamelus proserpina, sp. n.
M. persephone, sp. n.
M. sponsa, sp. n.
"Delphax" thyestes, sp. n.
D. ordovix, sp. n.
D. parysatis, sp. n.
D. ostorius, sp. n.
D. lazulis, sp. n.
D. leimonias, sp. n.
D. astyanax, sp. n.
D. algebra, sp. n.
P. dilpa, sp. n.
Proterosydne, g. n.
P. arborea, sp. n.
Stenocranus pacificus, sp. n.
S. agamopsyche, *
Saccharosydne, g. n.
S. saccharivora *
Fam. Derbidae
Suva koebelei
Basileocephalus thaumatonotus
Phaciocephalus nesogonias, sp. n.
P. nesodreptias, sp. n.
P. miltodias, sp. n.
P. pullatus, sp. n.
P. minyrias, sp. n.
Thyrocephalus leucopterus
Rhotana halosydne, sp. n.
Niphadodite, g. n.
N. insulicola, sp. n.
Pyrrhoneura saccharicida
P. citharista, sp. n.
P. (*Nesoneura* subg. n.)
P. (*N.*) *vitiensis*, sp. nov.
Nesocore, g. n.
N. fidicina, sp. n. *
Lyricen, g. n.
L. imthurni, sp. n.
Proutista humboltzi
Nesoniphas, g. n.
N. insignissima, sp. n.
Philadelpheia pandani
Muiria, g. n.
M. stridula, sp. n.
Phantasmatocera arborea
Nesophantasma, g. n. (*vitiensis*)
Swezeyia lyricen
Sikaiana nesiope, sp. n.

Superfamily *CICADOIDEA.*

This, after renewed investigation, appears to include the Tetigonioidea, thus embracing four families, which are distinguishable in the imago state as follows:

1. Three subcontiguous ocelli; sensory organs on the two basal segments of antennal flagellum very numerous; fore femora incrassate; no arolia; abdomen in the males with a sonorous apparatus on each side; venation very characteristic, tegmen typically with 5 "discoidals" and 8 apical veins, which occupy its greater part.....1 Cicadidae

1a Two ocelli, sometimes functionless; only a few sensory organs on the basal segements of antennal flagellum; fore femora rarely incrassate; arolia large.....(2)

2 Antennal flagellum composed of a large subpyriform basal segment and a slender seta; hind tibiae with one or two strong spines..... 2 Cercopidae

2a Antennal flagellum composed of numerous segments; hind tibiae unarmed; or if spined, almost always with more than 2 strong spines; usually seriately bristly.....(3)

3 Genae more or less dilated; pronotum never prolonged backwards ..... 3 Tetigoniidae

3a Genae not or scarcely dilated; pronotum prolonged backwards in a process (except in a few forms of dubious position) ..... 4 Membracidae

The ova are usually, (perhaps always), in all these families, inserted in slits made in twigs or leaves.

The families may be distinguished in the nymphal stages (or at least the ultimate) temporarily as follows: (there are never any ocelli, nor are there special sensory organs on the antennae, head or abdomen, etc.):

1 Frons with very numerous, closely set bristles in the middle; antennae with about 9 segments, decreasing in size from the basal one. Fore femora enormously incrassate, with one or more large spines beneath; fore tibiae raptorial, with spines or large tubercles beneath; fore tarsi with 2 segments, the first annuliform, arising at about two-thirds of the length of the tibia and directed backwards, second segment long, slender, cylindric, with 2 uneven claws. Fore coxae not shorter than femora. No arolia. Middle and hind tarsi with 2 segments, first very short .....1 Cicadidae

1a Frons not bristly. Fore femora rarely incrassate, not spined beneath; fore tibiae not raptorial; fore tarsi bisegmentate, of varying proportions, the basal segment arising from the apex of the tibia; 2 subeven claws. Fore coxae shorter, generally very

much shorter, than femora. Arolia present. Middle and hind tarsi never foliaceous (except the head and perhaps the legs....(3)

2 Dorsal surface more or less closely granulated, of very varying form, often foliaceous.....3 Membracidae.

2a Dorsal surface not granulate. General form of the adult, never foliaceous (except the head and perhaps the legs....(3)

3 Legs not spined or bristly. Antennae with 7 to 9 well marked, subcylindric, segments .....4 Cercopidae

3a Legs nearly always bristly. Antennae usually nearly as in the adults .....2 Tetigoniidae

The Cicadidae are on the whole the most primitive of the Cicadoidea, despite the specialization of the sonorous orgains in the males. Their undeserved elevation to the front of the Homoptera is due to the latter circumstance and to their, usually, larger size. Their primitiveness is displayed in their general form, and especially in the structure of the antennae in all stages, approaching in this the Heteroptera. The three other families are rather more closely allied among themselves than to the Cicadidae; in the nymphs, the antennae of the Cercopidae approach the condition of the Cicadidae, but are perhaps a little more specialized in the adults than they are in the adult Tetigoniidae. In the latter, the legs are almost always more specialized than in the Cercopidae, which, on the whole, may be accorded the lower rank. The Membracidae are simply specialized Tetigoniidae, by way, probably of forms like *Agallia*.

Most authors persist in estimating the Membracidae as a very distinct group. Fowler (1894 Biol. Centr. Amer. Hom., II, p. 1) says, for example, "The Membracidae, as a whole, form one of the most distinct and unmistakable groups of all insects." How little this is the case is shown by the fact that today the systematic position of *Ulopa, Acthalion* and others is disputed, while Fowler himself referred the Eurymeline *Gargaropsis* (a synonym actually of *Bythoscopus*) to the Membracidae. A little, fantastic, development of the pronotum and minor changes in the head and legs are almost all that are necessary to change an *Oncopsis* into a Membracid. The earlier nymphs of such Membracids as *Entylia* are essentially Tetigoniine in form and structure.

It may be useful to repeat that these 4 families, Cicadidae, Cercopidae, Tetigoniidae and Membracidae are closely elated, and that it is very absurd to separate the first from the other three, as do most authors, by the Fulgoroidea; while still more absurd

is the usual order of Cicadidae, Membracidae, Fulgoroidea, Cercopidae, Tetigoniidae.

Cicadidae.

The Cicadidae have been divided by Distant into three subfamilies, characterized by the tympanal coverings, but the divisions do not seem natural, the Cicadidae being in fact remarkably homogeneous.

(a). Australian Species.

As previously remarked, the Australian Cicadidae were discussed by Goding & Froggatt (1904 P. Linn. Soc. N. S. Wales XXIX, 561-670, Pls. XVIII-XIX); since then a number of supposedly new genera and species have been described by Distant and enumerated in his "Synonymic Catalogue of Homoptera. Part I Cicadidae" (1906, pp. 1-207). The Australian forms added since Goding & Froggatt's Monograph are as follows:

1 *Macrotristria nigronervosa* Distant 1904 A. M. N. H. (7) XIV 329..... Queensland
2 *Cicada graminea* op. c. 428..... Queensland
3 *Dundubia vaginata* (Fabr.) [=*mannifera* Stal]
(*Tettigonia vaginata* Fabr., 1787 Mant. Ins. II 266), said to be from Australia as well as India and the Malayan Region, but doubtfully correctly.
4 *Abricta elseyi* Distant 1905 A. M. N. H. (7) XVI, 281 .....North Australia.
5 *A. castanea* op. c., 27.....North Australia.
6 *A. burgessi* op. c., 28.....Queensland.
7 *Burbunga inornata* op. c., 29.....W. Australia.
8 *Gudanga boulayi* op. c., 208.....do.
9 *Cicadetta waterhousei* (*Melampsalta*) op. c., 271.....
..... S. Australia.
10. *C. lactea* (*M*) l. c.....Victoria.
11 *C. issoides* (*M*) op. c., 272.....
..... New South Wales, W. Australia.
12 *C. montrouzieri* (*Birrima*) op. c., XVII 388 .....
..... New South Wales.
13 *Pauropsalta stigmatica* 1905, op. c., XVI, 273..S. Australia.
14 *P. damcli* l. c.

15 *Urabunana segmentaria* op. c., 274.....Queensland.
16 *Cyclochila virens* 1906 Entom., XXXIX 148..Queensland.
N. B. *C. australasiae* var. *spreta* God. & Frogg. was omitted in Mr. Distant's Catalogue.

(b). Fijian Species.*

Only four species have been noted by Distant, and I can add only 3, (2 from my own collection), one of which, however, is new.

1 *Cyclochila australasiae* (*Tettigonia*) Donovan 1805 Ins. New Holland, Hem. Pl. 2, f. 1; a large male, expanding 120 mm. (in my collection). (**)
2 *Macrotristria angularis* (*Cicada*) Germar 1834 Rev. Ent. II, 68; a large male, expanding 131 mm., with dark ferruginous frons (in my collection). (**)
3 *Cicada kuruduadua* Distant 1881 Tr. E. S. London 645; Waterhouse 1882 Aid ident. Ins. I, Pl. C.
4 *Sawda* (*?*) *vitiensis* Distant 1906 Entom XXXIX, 12. (*Sawda* is probably not distinct from *Cosmopsaltria*).
5 *Diceropyga distans* (*Dundubia*) Walker 1858 List. Hom. Suppl. 10 (=*subfascia* (*Dundubia*) op. c., 11), recorded from Ovalau by Walker; 2 males and 1 female, the largest expanding 92 mill., taken at Rewa (March) by Mr. Muir.
6 *D. stuarti* (*Cosmopsaltria*) Distant 1882 Pr. Zool S. London 125 Pl. VII, f. 2;

Mr. Muir has taken 2 males at Rewa (March), which differ from Distant's descriptions as follows; they are 37 mill. long to the apex of the tegmen and expand 72 mill, being thus much larger; the frons is not so much produced basally as in Distant's figure, and (as somewhat shown in Distant's figure) the opercula do not nearly reach two-thirds of the length of the abdomen. Further, judging again by the figure, the opercula are less divergent during their first half, interiorly, and then more obliquely rounded.

* I employed the terms "Viti" and "Vitian" in my first memoir, but Dr. Brigham assures me that "Fiji" and "Fijian" are the correct terms to use.

** Mr. Froggatt, who has examined these specimens, doubts very much that they came from Fiji.

Cicadetta Kolenati.

This is a large genus of about one hundred described species, about three-fifths belonging to the Australasian Region. The following species is the first recorded from the Fiji Isles, and is the seventh Fijian Cicadid.

1. *tympanistria* sp. nov.

Pl. I, figs. 1-3.

Male. Ochreous; ocelli narrowly and incompletely margined with black. Eyes dark purplish brown. Pronotum with a median stripe and the hind margin yellow; six wedge-shaped black spots, the lateral ones rather irregular. Mesonotum a little embrowned, with 3 irregular black suffusions, the middle one somewhat dumb-bell shaped, with an incomplete yellowish-brown line down its middle; tufted posteriorly with golden yellow hair. Cruciform elevation yellow, the ends of the arms more or less fuscous. Metanotum yellow. Tegmina and wings milky hyaline, venation dark fuscous except the costal, subcostal, and sutural veins of the former which are yellowish green. The base and sides of the first tergite black, rest of this, the 2nd and 3rd (the latter narrowly dark apically) and basal half of 4th, yellow, the rest more or less fuscous. The whole of the underside luteous except as follows: antennal whip more or less fuscous; labium, tibiae and tarsi greyish-yellow; spines on fore femora black-tipped; sides of first sternite widely fuscous; apical three-fourths of abdomen purplish fuscous. Vertex rather flat, scarcely prominent before the eyes, about as wide between the eyes as the width of an eye. Frons rather narrow, scarcely as wide at base as the tempora together. Labium reaching just beyond middle coxae. Pronotum widening sublaminately posteriorly, not toothed laterally. Fore femora with three spines, the 1st the longest. Opercula oblique, narrow, at least twice as long as wide, subconstricted medianly externally, not reaching to the apical margin of the first sternite. Metasternum produced medianly in a small subvertical plate. Medioradial stalk elongate, completely fused, about as long as its first inferior branch; first apical cell a little longer than the second. Pygophor elongate, transversely striate.

Length to apex of abdomen 11 mill., expense of tegmina 30 mill.

Hab. Fiji, Rewa. (M).

The colouring, venation and opercula separate this from any *Cicadetta* known to me. It has an additional peculiarity in that the membranal appendix to tegmina and wings is of the slightest possible description, being visible only where the cells in meeting apically are very slightly notched.

Cercopidae.

The nymphs have, in all the forms I have seen, spineless and bristleless legs.

Since my first memoir, I have acquired a copy of Westwood's "Notice of a tube-making Homopterous insect from Ceylon" (Tr. E. S. London 1886 pp. 329-33, Pl. VIII), from which the systematic position of the remarkable *Machaerota* is recognizable. It is evidently closely allied to *Polychactophyes* and *Pectinariophyes*. I cannot recollect the exact appearance of *Hindola*, of which I have now no specimens for reference. This is the same as the preoccupied *Carystus* of Stal, and I do not think that the Swedish author would have placed *Carystus* and *Machaerota* in different subfamilies if the former had been the same as *Polychactophyes*. I cannot recognize Stal's subfamilies, the characters he uses to differentiate the 'Cercopinae' from the 'Aphrophorinae' being to me of little value for that purpose. Two subfamilies are here accepted, and are separable as follows:

1 Subcostal vein of wing forked about the middle (or basal of that), so that there is a "supernumerary" cell. [Pl. 1, fig. 4]. Nymphs, so far as known, living in their own frothy secretion. ..... *Cercopinae.*

2 Subcostal vein not forked, so that there is no supernumerary cell; veins united near the apical margin. [Pl. I, fig. 5]. Nymphs forming calcareous cases..... *Machaerotinae.*

Cercopinae.

The Australian and Fijian genera are disposable as follows, more for convenience than as an expression of their relationships:

1 Anterior margin of pronotum rounded.....(2)

1a Anterior margin of pronotum straight.....(6)
2 Head strongly narrowed near the base, elongate, subascendant.....5 *Philagra*
2a Head not longer than wide across the eyes, not suddenly narrowed.....(3)
3 Tegmina very convex, little longer than broad..4 *Bathyllus.*
3a Tegmina little convex, at least twice as long as broad..(4)
4 Vertex and pronotum carinate.....1 *Cercopis.* [=*Aphrophora*].
4a Vertex and pronotum not carinate.....(5)
5 Tegmina with level surface, pubescent, not punctured..... 2 *Eurycercopis.*
5a Tegmina irregularly raised and depressed, not pubescent, but very closely punctured.....3 *Nesaphrestes.*
6 Ocelli nearer to one another than to the eyes.....(7)
6a Ocelli not nearer to one another than to the eyes..... 11 *Cosmoscarta.*
7 Frons sulcate.....(8)
7a Frons not sulcate.....(11)
8 Posterior margin of pronotum medianly truncate..... 7 *Aufidellus.*
8a Posterior margin of pronotum emarginate.....(9)
9 Pronotum somewhat hairy, with 8 callous spots along the anterior margin.....8 *Petyllis.*
9a Pronotum with not more than two callous spots.....(10)
10 Tegmina subopaque, pale, yellowish-brown, veins broad and clearly marked.....9 *Aufiterna.*
10a Tegmina opaque, coriaceous, black and red, veins narrower, more obscure.....10 *Euryaulax.*
11 Scutellum longer than wide..... .....12 *Tomaspis* (two Walkerian species).
11a Scutellum equilateral .....13 *Nesaphrogenia*

Nesaphrestes gen. nov.

Allied to *Clovia*, but the clypeus is longitudinally carinate, generally strongly, and the tegmina are much narrower. I have no examples of *Clovia* now to examine, but comparing with the rather poor figure of *C. birarensis*, Kirkaldy (in Tr. E. S. London 1905, Pl. XVII, f. 3,) the pronotum in *Nesaphrestes* is acute-angularly emarginate posteriorly, also the brachial vein of the wing forks between the cross-vein and the apex, (not *at* the cross-vein), and there are 4 apical cells in the teg-

men. Also allied to *Eurycercopis*, but the tegmina are unevenly impressed (principally longitudinally and along the subcosta), and are finely and closely punctured. Type *muiri*. There are two species, distinguished by the size, colour, &c.

1. *dreptias* sp. nov.

Vertex, pronotum and scutellum pale yellowish-brown, suffused and transversely barred, brokenly and irregularly, with darkish fuscous, or irregularly suffused; posterior angle of scutellum pale yellowish-brown. Frons ventrally pale yellowish-brown, with curved concentric dark fuscous lines radiating from a median pale yellow line and practically attaining the lateral margins. Apical third of frons, the clypeus, lora coxae, sterna in part laterally, apical segment of labium pleurites, &c., blackish. Tegmina coriaceous, fuscous, darker on the corium, a spot on the extero-lateral margins near the apex, and the apical and subapical veins, whitish. Fore and middle femora blackish-brown, pale at the apex, hind femora blackish brown; tibiae dark fuscous, annulate or marked with brownish-testaceous.

Female. Pygophor pale beneath, ovipositor dark.

Length 8-9½ mill.

Hab. Viti Levu, Rewa (March, Muir's No. 165), on a native tree "in the bush."

Nymphs pale testaceous, hind tibiae polished, spineless. Probably live in their own secretion.

2. *ptysmatophilus* sp. nov.

Brownish-ochraceous; face, pro- and mesosterna laterally, and tergites mostly, blackish; antennae ochraceous; sometimes a faint pattern of radiating lines on frons towards the lateral margins. Tegminal veins pale yellowish or yellowish-fuscous. Exterior half of basal third of corium suddenly and angularly narrowing on the middle third of exterior margin, blackish, a fuscous spot in the fourth apical cell. Legs yellowish-testaceous, fore and middle femora dorsally blackish-brown in the middle, fore and middle tibiae blackish-brown apically and basally.

Male. Sternites blackish, genital segments ochraceous.

Female. Pygophor ochraceous, ovipositor blackish.

Length (male) 5½-(female) 7¼ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., M.).

Nesaphrogenia gen. nov.

Allied to *Locris*, but is very feebly, if at all, carinate on the frons, and the pronotum is angularly emarginate at the base medianly. The head dorsally is much more obtusely and roundly angulate anteriorly. Pronotum and tegmina rugosely-punctured, apical three-fourths of the former and the head strongly declivous. Wing venation similar to that of *L. vestigans* and *amauroptera* as figured by Breddin.

1. *vitiensis* sp. nov.

Head, pronotum anteriorly, scutellum and body beneath, pale yellowish-brown; base of frons ventrally, antennae, last segment of labium dorsally, &c., dark fuscous or blackish-brown. Ocelli rubid. Rest of pronotum pale yellow. Tegmina pale yellowish-brown suffused with rosy, especially laterally and apically, with short, yellowish pubescence (especially on clavus); veins rosy, at least the lateral and apical ones; wing-veins dark fuscous. Legs pale yellowish-testaceous, tibiae more or less fuscous in part. Sternites more or less fuscate.

Length $5\frac{1}{3}$ mill.

Hab. Viti Levu, Rewa (Feb., Mar., M.)

Machaerotinae.

At the moment of going to press, I have received the first part of the 68th Vol. of the Stettiner Ent. Zeit., containing a review of this subfamily (*). The Australian genera may be disposed as follows:

1 Scutellum not sulcate; without an appendage.....(2)

1a Scutellum sulcate with an appendage...3 *Pachymachaerota.*

2 Vertex almost perpendicular, very short. Nymph cases elongate, subconical, more or less porrect, gradually widening from the base.....1 *Polychaetophyes.*

2a Posterior margin of head raised. Ocelli farther apart. Frons more swollen. Pronotum less declivous, and longer in proportion to head. Nymph cases smoother and slenderer .....2 *Pectinariophyes.*

The first two have been omitted by Schmidt. In *Pachymachaerota* he places *Machaerota pugionata* and *signoreti* (=|| *pugionata* Sign.).

* E. Schmidt "Monographie der Subfamilie Machaerotinae Stal....." pp. 165-200, figs. 1-8 (May, 1907.)

Tetigoniidae.

Further investigation has convinced me that the subfamilies proposed in my former memoir cannot stand. Search has failed to reveal any sharply limited characters to form subfamilies. There is complete gradation from *Tetigonia* to *Eurymela* in the position of the ocelli and in the form of the leg spines. *Eurymela* is remarkably Cercopoid, especially apparently as regards the spines of the hind tibiae, but there is a fundamental difference. The spines in the Cercopidae are apparently solid, direct projections from the leg, and have no value for springing purposes, while in *Eurymela* and other allied forms, in which there are strongly developed, solid-looking spines, each of these always emits a hollow bristle, which is of value for springing in proportion to its length and to the number on the leg. The bristles in the more typical Tetigoniidae are also hollow and not direct productions of the leg, but socketed. The difference between the spines of *Tetigonia* and *Eurymela* is that in the former, the socket is small, the bristle long; in *Eurymela* the socket is large and the bristle short. [Pl. XI, figs. 18-20.]

For convenience, the following tribes based on habitus, are temporarily retained. I do not feel certain that, compared with the divisions of the Fulgoroid families, the Cicadoidea ought not to be divided into 2 families, Cicadidae and Tetigoniidae, the latter forming three subfamilies, Tetigoniinae, Cercopinae and Membracinae, but such a question is of minor importance, so long as the relative values of the divisions are understood.

1 Legs always more or less spiny or strongly bristly....(2)

1a Legs unarmed or feebly bristly.....(10)

2 Ocelli on the dorsal part of the head, distinctly away from its anterior margin.....(3)

2a Ocelli (if present) on the margin between vertex and frons; or dorsally, practically contiguous with the margin; or on the ventral side of the head.....(6)

3 Spines on the hind tibiae usually feeble except on one edge where they are strong, with rather short bristles. Stout forms, the head usually more or less laminate.....1 Ledrini

3a Bristles on the hind tibiae strong and long, not spinose. (4)

4 Exterior discoidal area of tegmen undivided up to the apical cells; ocelli on the vertex anterior to the apical margin of the eyes ..... 8 Macroceratogoniini

4a Exterior discoidal area divided, so as to form an apical cell ..... (5)

5 Elongate forms; ocelli basal of the anterior margin of the eyes, on the vertex.....10 Tetigoniini

5a Stouter forms; ocelli apical of the anterior margin of the eyes, on the vertex (Gyponidae auctt) .....9 Penthimiini

6 Vertex raised perpendicularly at the sides and base. Exterior discoidal area of tegmen undivided to the apical cells ..... 7 Iassini

6a Vertex not raised at the sides and base. Exterior discoidal area divided (in the long winged forms at least).....(7)

7 Head exceedingly declivous; ocelli on the vertex ventral of the bend of the head; spines and bristles on hind tibiae somewhat diverse in different forms.....
.....(Bythoscopidae auctt) 3 Eurymelini

7a Vertex usually more or less porrect; ocelli (if present) on the angular margin of the head.....(8)

8 Radial, median and brachial veins very obscure basally, (apparently springing independently from the basal cell or uniting close to it, except *Aneono* and *Dialecticoptera*); ocelli absent or feeble.....5 Eupterygini

8a Venation normal (except in short winged forms, or if obscure, then so all over); ocelli on the angular margin of the head, or touching it dorsally, rarely obsolescent.....(9)

9 Vertex strongly emarginate basally, ocelli in pits on the angular margin; legs spiny.....2 Stenocotini

9a Vertex rarely much emarginate basally, ocelli never in pits, (or if so, then the legs bristly, not spiny)..4 Phrynomorphini

10 Head laminate or at least elongately produced. Venation degraded .....6 Cephalelini (restr.)

10a Head never elongately produced, never laminate.....
.....(incl. Kahavaluinae) 11 Megophthalmini

Tribe Ledrini.

This tribe is nearly always characterized as having a foliaceous pronotum, owing to the fact that *Ledra* is the only European genus and that the tribe is not represented in North America. It is characterized by the more specialized legs and by the dorsal position of the ocelli, but is not altogether natural. Some forms, e. g., *Rhotidus*, have a very close resemblance to Phrynomorphine genera such as *Annidion*, but are distinguished by the position of the ocelli.

Provisional Table of Genera.

1a Head broadly laminate.....(3)
2 Claval suture obsolete.....1 *Sichaca*
2a Claval suture distinct .....2 *Titia*
3 Pronotum with the lateral margins acute-angulately projecting .....(4)
3a Pronotum not as above.....(5)
4 Pronotum anteriorly in the middle and head, perpendicularly declivous .....3 *Proranus*
4a Pronotum and head a little declivous.....4 *Tituria*
5 Eyes exteriorly margined by part of the vertex.....
.....5 *Betsileonas*
5a Eyes not margined exteriorly.....(6)
6 Hind tibiae dilated .....(7)
6a Hind tibiae cylindric.....(10)
7 Pronotum with a compressed auriform process sublaterally .....6 *Ledra*
7a Pronotum normal .....(8)
8 Vertex anteriorly truncate, basally with 2 flat, remote tubercles .....7 *Oclasma*
8a Vertex not truncate, without the tubercles .....(9)
9 Pronotum declivous .....8 *Platyhymna*
9a Pronotum not declivous .....9 *Ledromorpha*
10 Tegmina short .....10 *Dusuna*
10a Tegmina normal .....(11)
11 Tegmina reticulate apically .....(12)
11a Tegmina not reticulate .....13 *Ledropsis*
14 *Confucius,* 15 *Rhotidus,* 16 *Rubria.*
12 Pronotum laminately ridged .....11 *Jukaruka*
12a Pronotum not ridged .....12 *Camptelasmus*

Distant has overlooked the fact that *Petalocephala* is a synonym of *Camptelasmus.*

In the "Homoptera-Fauna von Ceylon," Melichar refers *Gypona striata* Kirby to *Siva* (=*Krisna*), and *G. prasina* Walker to *Acropona,* both Phrynomorphine genera. I cannot now refer to the types, which are presumably in the British Museum, but it was on a cotype of the former and a compared example of the latter, that I founded my genus *Eogypona* (1901 Entom. XXXIV, 38, inexplicably treated by Melichar as unpublished!) apparently a synonym of *Camptelasmus* (=*Petalocephala*), previously having renamed *G. striata,* "kirbyi," and *G. prasina,* "walkeri," on

account of their preoccupation.

Moreover, I do not think Melichar has correctly referred *Ledropsis*. I have not seen the types, but I believe that *Rhotidus* and *Rubria* are synonymous with this, or very closely allied. The nymphs of *Eogypona* (=? *Camptelasmus*) and *Rhotidus* (=? *Ledropsis*) are very different. The former are very flat, laminately foliaceous, and exceedingly thin, while the latter are not unlike the adults.

Rhotidus (=? *Ledropsis*).

The female ultimate sternite is very similar in all the species described by me. The posterior margin is slightly sinuate, with a small median notch which is almost obsolete in *ledropsiformis*. In *viridescens*, and *informis* it is obtuse-angled or somewhat rounded; in *horrendus* it is similar but more acute; in *monstrum*, *ingens* and *flavomaculatus* it is distinctly rounded.

Distant has described (1907 A. S. E. Belg. LI):

13. *acqualis* op. cit. 193. Queensland, and has transferred here *Ledra teliformis*, *navicula* and *cuspidata* Walker. This preoccupies the "*Rhothidus navicula*" of Stal, from Queensland, which is obviously not that of Walker; for the Stalian species, I propose the name of *stali*.

Ledropsis

Distant has described:

1. *froggatti* op. cit., 192..... New South Wales

Distant has also described:

Jukaruka (g. n.) *typica* op. cit. 190.....Queensland

In the list of unknown Australian forms, I omitted *Rubria sidnica* (*Xerophloea*) Stal 1859 Eugenie's Resa. Ins. 288(Sydney.)

Tribe Stenocotini.

This tribe differs from the Ledrini only in the position of the ocelli, which are situated in elongate pits on the margin connecting the vertex and the frons, and by the great emargination of the vertex basally. I know only three genera, all Australian, which have been analyzed on p. 368 of my former memoir.

Stenocotis (*).

1. *dimorpha* sp. nov.

Stenocotis planiuscula Kirkaldy 1906 Bull. H. S. P. A. Ent. I. Pl. XXV, figs. 4 and 8 (=male, not of Stal.).

Male. Whitish, tessellated with pale ferruginous and blackish-brown; frons pale with a longitudinal blackish median stripe widening out sometimes apically, sometimes basally. Underside and legs mostly black (hind tibiae sometimes brownish). Genital segments partly dark, partly pale. Tegmina hyaline, with the veins blackish and white alternately; the basal fourth blackish, closely spotted with testaceous and with some larger white markings; there is also a transverse dark band just apical of the middle. The apical veins are not reticulate.

Female. Pinkish-brown and yellowish-brown tessellated, or brownish and dark fuscous tessellated. Underside yellowish testaceous, nearly unicolorous. Tegmina nearly unicolorous (within range of ferruginous and yellowish) with semireticulate apical part. Ultimate sternite produced medianly, the produced part rounded posteriorly. Ovipositor much longer than the long pygophor which indeed extends distinctly beyond apex of tegmina.

Length 15 (male); 22-3 mill. (female).

Hab. Queensland, Bundaberg (Nov.) As it is just possible that these sexes do not belong to the same species, the male is selected as type.

N. B. In my former bulletin, p. 476, in the explanation of Pl. XXV, f. 4, for "female" read "male."

2. *reticulata* sp. nov.

Stenocotis planiuscula Kirkaldy, l. c., figs. 3, 6 and 7 (=female).

Females: like those of *S. dimorpha*, but with a slender longitudinal median blackish line on vertex; tegmina more reticu-

* Since this was in proof, I have received the 6th part of the A. S. E. Belg. LI (July 3, 1907) containing Distant's "Contributions to a Knowledge of the Ledrinae" (pp. 185-97.) He disputes my citation of *S. vittata* (=*depressa* Walker) and proffers instead *S. planiuscula*. I cannot accept this. In 1854 Stal founded *Stenocotis* for 2 species, *planiuscula* and *subvittata*. No type was mentioned and no comparison was made between the species. In 1856 Stal redescribed the genus and redescribed *subvittata*, figuring it. I hold that this fixes the type as *subvittata*; if not, *subvittata* is then the type, because I was the next author to deal with the genus and fixed it. The argument put forward by Distant, that *planiuscula* is the type because the first species mentioned by Stal. is worthless and inconsistent with Distant's own method in other cases. I was aware that Stal had cited *subvittata* as a synonym of *depressa* and quoted it as such on the next page, overlooked by Distant.

late apically. Pygophor almost as long as ovipositor, which is not longer than the tegmina.

Length 20 mill.

Hab. Queensland, Brisbane (June).

Distant has recently described.

S. nigrescens op. cit. 194, Queensland.

Smicrocotis.

1. *obscura*

Female ultimate sternite nearly truncate; pygophor almost as long as the ovipositor which scarcely extends beyond apex of tegmina.

2. *sidnica* sp. nov.

Similar to the type, but the vertex is very short, ascendant, rounded apically. Frons not longitudinally carinate in the middle. Pronotum not carinate. Testaceous (with a green tinge) tessellated with yellowish, pinkish-brown and blackish-brown. Face and sterna pale ferruginous-brown tessellated with blackish-brown and spotted with testaceous. Scutellum testaceous, tessellated with pinkish-brown. Tegmina hyaline tinged with cinereous, more or less feebly tessellated with dark and pale brown, veins pale ferruginous-brown, infuscate in parts, not reticulate. Legs subsanguineous, spotted with testaceous, femora more or less marked with blackish brown. Abdomen below blackish brown (except the apical margins very narrowly).

Length (male) 7½ mill.

Hab. New South Wales, Sydney, (Jan., K.).

This may be the male of one of the following species, but the non-carinate pronotum probably separates it.

Distant has described:

3. *pallescens* op. cit. 195, New South Wales.
4. *infuscata* l. c., Queensland.
5. *projecta* op. cit. 196, New South Wales.

Kyphocotis.

1. *tessellata.*

Female: ultimate segment like that of *Stenocotis dimorpha*, ovipositor extending somewhat beyond pygophor and a little beyond apex of tegmina.

Distant has described:

2. *fasciata* op. cit. 196, Queensland.
3. *parva* op. cit. 197, Queensland.

Tribe Eurymelini.

Although there is no sharply-drawn character separating this from the Phrynomorphini, it is convenient to reserve it for those forms in which the ocelli are actually ventral, that is apical, of the angulation of the head. It is in some of these forms that the frons is strongly demarcated from the vertex, though of course the "suture" is a false one and really only a deep impression in the chitin. At first I thought that this would prove a divisional character, but unfortunately it is only specific.

Provisional Table of Genera.

Trocnada and *Eurymeloides* are too vaguely diagnosed to admit of insertion. *Igerna* is probably near *Pediopsis*, but I do not now know the nature of the striation on the pronotum.

Strongylomma and *Melicharella* are known only by their descriptions.

1 Ocelli absent ..... 1 *Strongylomma*
1a Ocelli present ..... (2)
2 Tegmen with an appendix ..... (3)
2a Tegminal appendix absent, or if present, very minute and the head dorsally wider in the middle than at the sides (i. e. *Batracomorphus*) ..... (6)
3 Tegmina hyaline; appendix entire ..... (4)
3a Tegmina coriaceous, or at least the veins very strong; appendix not reaching beyond about half the length of the apical cells ..... (5)
4 At least one subapical cell in the tegmen..... 2 *Idiocerus*
4a No subapical cells ..... 3 *Pedioscopus*
5 Tegmina coriaceous, mostly dark with a white or coloured pattern, venation feeble ..... 5 *Eurymelias*
(=*Eurymeloides* Kirkaldy 1906, apparently not of Ashmead (*), type *hyacinthus* (Kirkaldy)
5a Tegmina subhyaline, dingily coloured, veins strong..4 *Ipo*

* Ashmead says "a double row of very weak spines," and cites no type.

6 A keel between the dorsal and ventral parts of the head ..... 6 *Melicharcila*

6a No such keel ..... (7)

7 Pronotum strongly striate obliquely ..... (8)

7a Pronotum transversely striate, if at all (**) ..... (9)

8 Anterior margin of dorsal part of head almost rectangular; face flattish. (type *virescens*) ..... 7 *Macropsis*

8a Anterior margin rounded; face convex (type *tiliae*) ..... 8 *Pediopsis*

9 Ocelli immediately at the base of the ventral part of the head ..... 9 *Epipsychidion*

9a Ocelli well on the ventral part ..... (10)

10 Tegmina reticulate apically. Frons angulate in profile, as also clypeus. Hind tibiae with 2 or 3 strong spines. Last ordinary sternite (female) bipartite ..... (11)

10a Tegmina not reticulate apically. Frons not angulate in profile, nor clypeus. Hind tibiae multispinulose. Last ordinary sternite (female) not divided ..... (12)

11 Last ordinary sternite (female) reaching the lateral margins of the abdomen ..... 10 *Eurymelops*

11a Last sternite not nearly reaching the lateral margins ..... 11 *Eurymela*

12 Lora not nearly touching the apical margin of the clypeus ..... (13)

12a Lora practically touching the apical margin ..... (14)

13 Frons separated basally; legs more or less specialized ..... 12 *Alseis*

13a Frons not separated basally; legs normal ..... 13 *Oncopsis*. (=*Bythoscopus* auctt; type *flavicollis*).

14 Frons separated basally. Antennae inserted in a feeble cavity, their bases free ..... (15)

14a Frons not separated basally. Antennae inserted in a deep cavity, beneath a ledge ..... (17)

15 Pronotum transversely striate; nymphs not horned nor dorsally serrate. (type *sanguinolentus* Provancher) ..... 14 (***) *Aceratagallia*

15a Pronotum not striate; nymphs horned and serrate ... (16)

16 Posterior margin of vertex regularly curved, the vertex being obsolescent behind the eyes. Nymph with two anterior

** Sometimes, in *Oncopsis*, the striation becomes a little oblique anteriorly.

*** These characters were pointed out and used for divisional purposes by Osborn and Ball in their treatment of *Agallia*. They are good genera, in my opinion.

projections on the head. (type *consobrina* Curtis=*puncticeps* Germ.) ..... 15 (***) *Agallia*

16a Posterior margin of vertex emarginate, but margining the eyes behind. Nymph with the entire posterior margin of the vertex elevated, truncate as seen dorsally. (type *novellus* Say) ..... 16 (***) *Agalliopsis*

17 Clypeus fused with frons.....(18)

17a Clypeus not fused with frons.....(19)

18 Face longer than wide.....17 *Nehela*

18a Face wider (between the eyes) than long..... ..... 18 *Thalattoscopus*

19 Pronotum reaching beyond the anterior margin of the eyes, first two wing veins apparently not confluent.....(23)

19a Pronotum not reaching as far as the middle of the eyes, first two wing veins confluent towards the apex.....(20)

20 Head dorsally wider in the middle than at the sides; a minute appendix close to apex of clavus....19 *Batracomorphus*

20a Head dorsally at least as wide at the sides as in the middle ..... (21)

21 Two subapical cells in the tegmen.....(22)

21a Three subapical cells..... 21 *Eurinoscopus*

22 Lateral keel of pronotum not reaching the eye, but curving far down onto the pleura. Head scarcely narrower than pronotum. Clypeus strongly convex, very broad at base, suddenly strongly narrowed beyond the middle to the rounded apex.... .....20 *Straganiopsis*

22a Characters not as above (=*Macropsis* auctt., type *lanio.*) ..... 22 *Bythoscopus*

23 Head dorsally angulate anteriorly, and angulately emarginate posteriorly. Pronotum sinuate posteriorly. Face about as long as wide between the eyes.....23 *Stonasla*

23a Head anteriorly lightly rounded. Pronotum truncate between the scutellar angles. Face much wider than long.... .....24 *Macroceps*

Idiocerus.

The venation in this large genus is very variable. The eleven Australian species are separable as follows:

1 Head spotted .....(2)

*** These characters were pointed out and used for divisional purposes by Osborn and Ball in their treatment of *Agallia*. They are good genera, in my opinion.

1a Head immaculate ..... (4)
2 Vertex with 2 spots ..... (3)
2a Vertex with 4 spots ..... 1 *kisseis*
3 Tegmina hyaline tinged with greyish or greenish; veins of corium sanguineous ..... 2 *nymphias*
3a Tegmina brownish fuscous, with two or three large translucent spots medianly ..... 3 *oreias*
4 Tegmina with a dark spot at junction of clavus and membrane and another at the apex of the basal part of the subcostal cell ..... 4 *orodemnias*
4a Tegmina with a longitudinal fuscous stripe ..... (5)
4b Tegmina immaculate ..... (6)
5 General colouring yellowish or orange ..... 5 *xantho*
5a General colouring creamy grey, sometimes rosy ..... 6 *hylcorais*
6 Tegminal veins clear; some at least sanguineous .... (7)
6a Tegminal veins more obscurely indicated; testaceous or pale greenish ..... (8)
7 More or less suffused with deep rosy, veins concolorous ..... 7 *cupido*
7a Veins mostly clear green, some of the apical ones sanguineous ..... 8 *ipo*
8 Length over 6 mill ..... 9 *napais*
8a Length over 5 mill ..... 10 *aulonias*
8b Length 4 mill ..... 11 *nereias*

1. *kisseis* sp. nov.

Head pale testaceous, vertex with 4 black spots, the larger pair visible dorsally and nearer the eye than their own diameter: apical of these a smaller pair, a little nearer together; between these 4 the vertex is sometimes suffused with rosy, the tint encroaching a little dorsally also. Pronotum greyish-rosy. Scutellum rosy with 3 testaceous spots, 2 anteriorly subcontiguous and one posterior. Tegmina pale olive testaceous, more or less greenish-iridescent, a little smoky at the base internally. Clypeus laterally sinuate, broader apically than at the base.

Male: tergites and valve more or less rosy, the latter transverse, sinuate.

Female: pygopher long, but much shorter than the ovipositor. Length 5½ mill.

Hab. Queensland, Kuranda (Aug., P.).

N. B. The rosy hue may be entirely absent.

2. *nymphias* sp. nov.

Greyish testaceous, vertex ventrally with 2 small spots anteriorly, almost concealed by pronotum. Scutellum with 2 small wedge-like spots anteriorly, partly concealed by the pronotum. Veins of corium sanguineous (sometimes brownish).

Length 3½ mill.

Hab. New South Wales, Sydney (Jan., K.), Mittagong (Jan., K), Koebele's No. 2356, on *Melaleuca*.

3 *oreias* sp. nov.

Differs from the preceding by the brownish fuscous tegmina which have 2 larger and one smaller translucent spots at the middle in a transverse row, the innermost being on the clavus.

Length 3½ mill.

Hab. New South Wales, Mittagong (Jan., K.), in poor condition.

4 *orodemnias* sp. nov.

Form of *xantho*, but the base of the pronotum is slightly emarginate. Head, pronotum, scutellum and sterna greenish testaceous, much discoloured, especially on the head. Tegmina hyaline cinereous, a blackish or dark fuscous spot at junction of clavus, corium and membrane, and another at the apex of the basal part of the subcostal cell; veins greenish testaceous, partly suffused with dark fuscous. Legs greenish testaceous. Tergites dark fuscous at least laterally.

Female: last sternite subtruncate, pygophor pale reddish-brown, ovipositor dark.

Length 4½ mill.

Hab. Queensland, Kuranda (Aug., P.).

5 *xantho* sp. nov.

Head, pronotum, scutellum and sternites yellow or orange-yellow. Sterna and legs yellowish testaceous. Tegmina hyaline, subiridescent, tinged with cinereous, a darkish fuscous longitudinal stripe down the middle of the tegmen and a fuscous spot at the apex of the clavus.

Female: last sternite subtruncate.

Length 4-4¼ mill.

Hab. Queensland, Kuranda (Aug., P.).

6 *hylcorais* sp. nov.

Pl. II, figs. 1-2.

Like *aulonias*, but smaller and narrower; a somewhat elongate zigzag smoky line down the middle of the tegmina.

Female: last sternite subtruncate, slightly notched in the middle.

Length 4⅞ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

7 *cupido* sp. nov.

Form of *xantho*. Head, pronotum, scutellum and underside pale yellowish often suffused with rosy. Tegmina pale yellowish testaceous suffused with rosy, veins rosy; subcostal cell, apical cells, apex of subapical cells and appendix, hyaline.

Length 3 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

9 *napais* sp. nov.

Pale testaceous, more or less tinged with green, immaculate. Eyes reddish-black. Tegmina hyaline, subcostal etc. greenish.

Male: pygophor long, narrow, apically acute, turned outwards a little.

Length 6½ mill.

Hab. Queensland, Bundaberg (Nov., P.).

10 *aulonias* sp. nov.

Close to *kisseis*, but pale creamy-grey in general colour, though it may be more or less rosy or reddish. There are no head spots.

Male: valve triangularly notched in the middle; pygophor broader than in the last, ovipositor not so long as in the last.

Length 5⅛ mill.

Hab. Queensland, Cairns (Aug., P.); Bundaberg (Sept.-Dec., K.).

11 *nereias* sp. nov.

Pale greyish-yellow, more or less suffused with orange, subiridescent. Eyes fuscous. Head and eyes much wider than, and strongly decumbent on, the pronotum, vertex dorsally about as

wide in the middle as at the eyes, gently rounded anteriorly. Frons rounded in profile, clypeus wider apically than at the base. Tegminal veins very feeble.

Female: last sternite slightly emarginate roundly.

Length 3¾ mill.

Hab. New South Wales, Sydney (Jan.-Feb), Parramatta (Jan. K).

12—sp. nov.

One immaturely coloured example from Mittagong (Jan. K) of a new species.

Ipo.

1. *ambita.*

Posterolateral margins of frons straight, ocelli at about the middle of each side; lora and clypeus touching the reflexed hind margin of the genae. First subapical cell longer than the second. All these details are very similar in *I. conferta.*

3. *honiala.*

Posterolateral margins of frons sinuate.

4. *aegrota.*

Posterolateral margins of frons straight.

5. *pompais*, sp. nov.

Form of *I conferta* but smaller and paler. Pale testaceous, strongly, minutely and closely spotted with brownish fuscous; frons (and usually a thin longitudinal line from frons to base of pronotum) pale testaceous. Scutellum pale ferruginous, anterolateral angles dark fuscous. Tegmina hyaline tinged with cinereous, suffused and mottled with light and dark fuscous; an undulating transverse narrow whitish stripe near the middle; extero-apical part of tegmina almost immaculate, one or two whitish spots near the commissure. Beneath brownish testaceous. Head nearly truncate anteriorly. Eyes projecting laterally distinctly farther than the pronotum.

Male: last segment roundly emarginate, pygophor subconstricted near the base.

Length 5 mill., breadth 2½ mill.

Hab. Queensland, Nelson (July P).

Macropsis.

Macropsis Lewis 1835 T. E. S. London I, 40 (div. A.)
=*Pediopsis* auctt, (part).

The four Australian species may be separated as follows:

1 Only two subapical cells (the third being merged in one of the apicals) ..... 1 *ocroe*

1a Three regular subapicals ..... (2)

2 Tegmina pale, unornamented..... 2 *thymele*

2a Tegmina with many dark markings..... (3)

3 Face evenly rounded; pronotum immaculate except for the punctuation ..... 4 *thoantias*

3a Face unevenly raised in parts; pronotum with a sublateral dark line ..... 3 *thyia*

1. *ocroe*, sp. nov.

Head, pronotum and scutellum pale ochraceous, closely and finely punctured with purplish-brown. Tegmina hyaline, pale yellow brown, veins (except the subcostal) dark fuscous, multi-annulate with whitish, apical cells and tergites more or less fuscate. Sternites paler. There are only 2 subapical cells; the 1st apical is very small and the second is long, touching the base of the first subapical. (This is a constant character in 8 specimens).

Length 3½ mill.

Hab. Queensland, Kuranda (Aug., P.), Nelson (July P.).

2. *thymele*, sp. nov.

Close to the last but the punctures are fainter, and the anterior half of the pronotum is lightly keeled or at least there is a smooth line there. Tegmina pale yellowish hyaline, nervures weaker, concolorous, a fuscous speck at apex of sutural cell, another at apex of clavus; a transverse vein in the subcostal, and the 1st subapical vein, &c., fuscous. There are three subapical cells.

Length 4 mill.

Hab. Queensland, Bundaberg (Sept. -Dec. K).

3. *thyia*, sp. nov.

Resembles the first, but more ornate and there is an entire smooth line on the pronotum. The face, unlike the 3 others, in which it is regularly rounded, is unevenly raised or ridged in

parts. Pronotum with a curved broken longitudinal blackish-brown sublateral line. Tegmina hyaline, strongly punctured with fuscous, the punctures rendering the clavus and base of corium opaque; an irregular band across the tegmina and the apical sixth dark greyish-fuscous, veins fuscous multiannulate with whitish. Legs testaceous closely speckled with fuscous, tibiae multiannulate with whitish. There are 3 subapical cells.

Length 3½ mill.

Hab. Queensland, Kuranda (Aug.P).

4. *thoantias,* sp. nov.

Resembles the last, but the face is not ridged and the pronotum is immaculate with dark punctures. Tegminal pattern more obscure, a dark line across the base. There are 3 subapical cells.

Length 3½ mill.

Hab. New South Wales, Sydney (Jan. K).

Epipsychidion.

According to the horismology now used, the tegmina have 3 subapical and 4 apical cells, and the subcostal is divided apically by an oblique vein.

1. *epipyropis.*

(Bull. I p. 346, Pl. XXIII, figs. 4-6.)

Female. The second subapical cell extends further apically than the others. Last sternite truncate. The figure of the adult (fig. 4) does not show the crossveins.

Male. What is probably the male of this species has a rounded head, a little longer at the eyes than in the middle. Pale yellowish testaceous, mottled and spotted rather obscurely with pale brownish cinereous, veins not annulate. Vertex and pronotum without black lines, but with traces of pale longitudinal lines. Last sternite roundly emarginate, plates elongate.

Length (males) 5¼ (females) 6½ mill.

Bred from nymphs on *Leptospermum.*

Alseis gen. nov.

Vertex very declivous, dorsally very short, wider laterally than in the middle; eyes touching the base of the tegmina. Frons

suboval, basally extending beyond the apical margin of the vertex; antennal ridges straight, entire, nearly as wide as frons. Vertex and pronotum transversely striate. Ocelli on a line with the insertion of the antennae and the base of the frons, not touching the latter.

1. *osborni,* sp. nov.

Whitish-testaceous, very finely mottled with brown, spotted with dark fuscous, a large suffused fuscous inverted arrow on anterior part of pronotum. Tegmina irregularly mottled and spotted with fuscous. Fore and middle legs blackish-brown, obscurely spotted with pallid; hind legs fuscous, obscurely marked with darkish.

Length (female) 8¾ mill.

Hab. Queensland, Brisbane (June P), Kuranda (July P).

Oncopsis.

Oncopsis Burmeister 1838 Gen. Ins. I, Bythoscopus, 3rd page. =*Bythoscopus* auctt.

1. *balli,* sp. nov.

Bright yellow, closely punctured with brown on head and pronotum. There is a laevigate horse-shoe mark on the face near the clypeus, broken at the base, and there are 2 smooth pits nearer the base of the face. There is also a small smooth area on the pronotum on each side anteriorly, and the striation is fine and somewhat reticulate. The scutellum is punctured closely only on the disk. Apical margins of clypeus and genae, marks on legs, sterna, &c., blackish. Tegmina cinereous hyaline, a blackish smudge near the base, veins strong, yellowish brown, sometimes blackened.

The head is not visible dorsally, except close to the prominent eyes, nor is the anterior margin of the pronotum visible.

Length 5 mill.

Hab. Queensland, Bundaberg (Sept.-Dec. K.).

I have great pleasure in naming the last two species after Professors Osborn and Ball ,whose work, conjointly or separate, on the Homoptera, especially the genera *Deltocephalus, Agallia,* &c., forms a model for future research.

Eurinoscopus.

The Australo-Fijian species may be disposed as follows. This is a very difficult genus and I have been unable to deal satisfactorily with several specimens, including Muir's Nos. 112 and 157; the latter were off native trees and were heavily stylopized.

1 Pronotum and tegmina freckled with brown.....(2)
1a Pronotum, at least, immaculate.....(4)
2 Face spotted with black, tegmina strongly freckled.....1 *lentiginosus* (Pl. II, figs. 7-8)
2a Head immaculate, tegmina more faintly freckled....(3)
3 Smaller, darker, frons less flat, &c.....2 *sontiates*
3a Larger, paler, frons flatter .....3 *soboles*
4 Tegmina cinereous, punctured with brown..8 *hamadryas*
4a Tegmina yellowish or green .....(5)
5 Tegmina with brown freckles.....4 *dryas*
5a Tegmina not freckled .....(6)
6 Uniform pale brownish yellow .....7 *pelamys*
6a Bright green, head and scutellum, &c., often yellowish (7)
7 Head dorsally as wide laterally as in the middle..5 *pelias*
7a Head dorsally distinctly wider in the middle than laterally ..... 6 *molestia*

8. *hamadryas,* sp. nov.

Cinereous, lora and clypeus often infuscate. Pronotum usually clouded with fuscous, the posterior angle usually broadly blackish. Tegmina with fuscous veins and obscure fuscous puncturation. Legs more or less fuscous.

Length 4¼-4½ mill.

Hab. Viti Levu, Rewa (March & Nov. M).

Tribe Phrynomorphini.

The genera in this are very hard to limit and define, and they are not always altogether natural. It is probable that future classifications will be based largely upon nymphal characters. A number of groups may be formed, but cannot be altogether satisfactorily limited, for instance, the genera with the anterior margin of the vertex deeply and completely channelled transversely, merge gradually into those with simple head; these again merge into those with foliaceous or acute anterior margin of the vertex.

The venation is also often irregular, the characterization of the *Deltocephalus-Phrynomorphus-Thamnotettix* group being in especial confusion. The extra-Oceanian material at hand for comparison being entirely inadequate, I have preferred not to make more new genera than could be helped; at the same time it is doubtful whether the recognized authorities on Cicadoidea (for instance, Osborn, Ball, Van Duzee, or Melichar) would accept the generic positions I have assigned to some of the species, or would agree among themselves. The difficulty of sharply limiting these genera is evident from the synonymy of several species, according to these various authors, during the past twenty years, ex. gr. *Deltocephalus osborni, Athysanus seminudus, Limotettix striola,* and *Thamnotettix striatula.*

The study of the Phrynomorphini is not lightly to be undertaken, but, more necessarily perhaps than in any other Cicadoid group, the known species of the world must be revised by some competent Hemipterist. It would be an immense advance in the knowledge of the group, if Osborn & Ball, whose studies on the North American forms have formed a model for future work, would undertake this task. The nymphs usually present very important specific characters, as these authors have shown, but in some genera at least, the number, colour, and disposition of the abdominal bristly hairs is specifically very valuable, a character neglected up to the present.

Stegelytra.

It is evident that two quite different genera are confused under this name; they may be separated as follows:

(a) Vertex anteriorly rounded, angulate in profile; pronotum anteriorly arched, posteriorly slightly emarginate. Tegmina with 2 subapical cells .....*Stegelytra* (type *alticeps.*)

(b) Vertex anteriorly subangulate, almost porrect in profile; pronotum anteriorly truncate or subtruncate between the eyes, posteriorly truncate between the scutellar angles. Tegmina with 4 subapicals, apicals reticulate.....*Iberia* nov. (type *bolivari*).

Thomsonia.

3. *kirschbaumii.*

Add to localities: Bundaberg (Sept.-Dec., K.).

Hybrasil gen. nov.

Closely allied to *Thomsonia*. Head strongly and completely channelled on top, clypeus somewhat constricted at base. Pronotum regularly roundly arched anteriorly. Tegmina with 2 subapical cells and 5 apicals, the first being in a line with the subapicals, the fifth very large. Valve present in the male.

1. *brani,* sp. nov.

(Pl. II, fig. 18).

Male: vertex, pronotum, scutellum, antennae, legs and pleurites pale yellowish green, including the channel on the top of the head; frons and a very narrow border on the vertex basal of the channel, sterna and abdomen, black. Tegmina pale smoky-yellowish, hyaline, with a median smoky smudge down the middle; veins more or less suffused with fuscous, except the pallid subcostal, radial and claval veins. Wings smoky, veins dark. Valve very short, plates pale, together triangular, then suddenly acuminate and produced apically, not as long as pygophor.

Female: head entirely pale yellow, except for 2 narrow black lines on either side of the channel. Underside pale yellow. Tegmina less fuscate than in the male. Seventh segment truncate, pygophor broad, not as long as ovipositor.

Length (male) 4½ (female) 6 mill.

Hab. Viti Levu, Rewa (Mar. Muir).

Dryadomorpha.

In the unique type of *D. pallida,* it was not possible to interpret the obscure venation, but apparently there were no cross veins in the subcostal. Mr. Muir has collected a species at Rewa which I place here. The venation is somewhat like that of *Platymetopius;* there are two discoidals, the medians being nearly twice as long as the exterior and extending beyond it basally and apically; there are 5 or 6 cross veins towards the apex of the subcostal, and 5 apical cells and an appendix. The wing cells are also peculiar.

2. *lotophagorum,* sp. nov.

Greenish-yellow, head and pronotum more or less mottled with light fuscous, some more regular, rather darker, spots on the

lateral margin of the vertex anteriorly and on the lateral margins of the frons. Tegmina pale yellowish hyaline; interior half, obliquely, of membrane, and the appendix, pale smoky; apical vein sordid whitish; three dark fuscous spots on the commissure; apex of last apical cell acute, with a smoky spot. Legs pale brownish testaceous, speckled with black granules. Sternites greyish-fuscous. Lateral margins of pronotum acuminate behind the eyes.

Male: last segment very slightly roundedly emarginate.

Female: last segment obtuse-angulately emarginate medianly: pygophor rather swollen laterally in the middle, flattish.

Length 6-7 mill.

Hab. Viti Levu, Rewa (Mar.-Apr. Muir).

Tortor gen. nov.

Probably allied to *Dryadomorpha;* the vertex is however not depressed and is more rounded anteriorly.

Vertex flattish, slightly raised towards the middle from the lateral margins, about as long as wide across the small eyes, lateral margins converging anteriorly, apical margin roundly angulate. Frons concave, raised laterally, clypeus more or less fused, lora minute. In profile the head is thin, the lateral margins are flattened, narrowing apicalwards; ocelli very indistinct rudiments on this flattened part, at about half the length of the head. Pronotum transverse, about three-fourths the length of the vertex, longer than the scutellum. Tegmina elongate, subcoriaceous, veins very indistinct; the radial appears to be undivided almost till the apex of the tegmina, while the median is joined to cubital at least 5 or 6 times by short, transverse veins.

1. *daulias*, sp. nov.

Pale golden yellow. Eyes greyish.

Length 9 mill.

Hab. Queensland, Bundaberg (Sept.-Dec.).

The nymphs are not remarkable, being in general form and colour like the adults.

Tartessus.

This is evidently a large genus, as 15 species are now known from Australia alone. The forms described form three groups:

(a) Veins of tegmen dark multiannulate with white; *T. ianassa.*

(b) Veins unicolorous yellowish or brownish, sometimes more or less fuscate, divided into:

(c) face wholly, or in large part, blackish; *T. io, iphis,* and *fulvus* (part).

(cc) face wholly, or in greater part, pale; *T. iancira, ianthe, iambe, io, iphis, issa, itonias, idyia* and *fulvus* (part).

1. *fulvus.*

Bythoscopus fulvus Walker 1851 List. Hom. 866
Tartessus australicus Spangberg 1878 O. V. A. F. XXXV, I.
T. fulvus Signoret 1880 A. S. E. France 348 Pl. 9 fig. 74.
var. *T. syrtidis* Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 341 Pl. 24 f. 9.

This is a variable species; a single female from New South Wales, Sydney (Jan.) seems to agree with Signoret's description and figures, except that the eyes in Signoret's figure of the insect, are represented as not very decumbent on the pronotum and far from contiguous with the base of the tegmina. Beside this there are 4 males (not females, as wrongly stated in the description) of the var. *syrtidis,* a series of males and females very like the type, but differing in the colouring of pronotum, &c., (i. e., the presence of 5 or 6 brown spots along the anterior margin) and in the colour and pattern of the frons; it is unnecessary to bestow on them a varietal name. The figure of the face (l. c., Pl. 24, f. 9) of var. *syrtidis* gives a false impression (and refers rather to the type) as the whole of the face is black except narrow lines on the frons, and the antennae. The venation varies very little, sometimes there are 2 or 3 crossveins in the sutural area, sometimes these are absent. Subcostal cell divided by a somewhat oblique transverse vein about the middle, a little variable, of the first subapical (sometimes by 2 close together.) The 3 subapical cells extend apically about equally far.

Hab. New South Wales, Sydney (Jan.); Queensland, Cairns (Aug.).

var. *syrtidis,* Bundaberg (type, Oct.) Cairns (July) and Sydney (Jan.) bred from *Eucalyptus,* on Sandhills.

The genitalia appear identical in these forms, nevertheless I should have retained *syrtidis* as a good species, had not Dr. Perkins taken a male with a female of the second variety and a male

of the second variety with a typical female *fulvus*. It is exceeding common, and is one of the few leafhoppers that can be considered as a pest of *Eucalyptus*. It is parasitized extensively in the ova-stage by *Pterygogramma acuminata* and as an nymph by *Chalcogonatopus gigas*. Nymphs of this or an allied form are parasitized by *Prosanteon chelogynoides* and *Pipunculus picrodes* and *cruciator*.

2. *idyia*, sp. nov.

Black; base of vertex and basal half of posterolateral margin of scutellum, pale yellow; a narrow line on the genae contiguous with the lateral margin of the frons, a similar one on the pronotum contiguous with the posterior margin of the eyes, a tiny wedge at anterolateral angles of scutellum, pale ferruginous; labium, fore and middle legs (except basal two-thirds or more of femora) testaceous. Tegmina subhyaline, tinged with ferruginous, veins (somewhat suffusedly in most of them), median third or more of subcostal cell, blackish; basal two thirds of antesubcostal cell, whitish subhyaline. Vertex rounded apically, strongly striate transversely, formed as in *T. fulvus*, but a little more prominent anteriorly. Eyes as in *T. fulvus*. Frons basally strongly striate transversely, apically aciculate punctate. Genae with the apical margin less oblique than in *T. fulvus*, and clypeus shorter than in that species. Tegminal venation much as in *T. flavipes* but the cross-vein on the brachial near the base, and that towards the apex of the subcostal cell, are straight, not oblique; there are no cross veins in the clavus. Second subapical cell extending apically beyond the others.

Male: genital segments apparently much as in *T. pulchellus* but in all the specimens they are rather shrivelled.

Length 5½ mill.

Hab. Queensland, Nelson (July) type, Cairns (Aug.).

3. *itonias*, sp. nov.

Apparently allied to *T. pulchellus*, but differing by the form of the genitalia and by the vertex being obtuse-angular. Face immaculate, borders of the pieces rather more obscure, lateral margin of frons fairly straight. Sterna and sternites testaceous. Venation similar to *pulchellus*, but the median (inner discoidal) cell is longer, the crossvein in the subcostal straight; the first

subapical cell is very wide apically, consequently the apical part of the subcostal is very narrow and acute; subapical cells extending about equally far apically.

Length (male) 8¾ mill.

Hab. Queensland, Cairns and Kuranda (Aug.).

4. *issa,* sp. nov.

Superficially like the preceding but the vertex is roundly angulate and wider at the eyes than in the middle. Appendix to tegmina about as large, faintly smoky narrowly bordered inwardly with hyaline. Subcostal cell much wider and is subparallel beyond the transverse vein, apical margin oblique. Subapical cells extending about equally far apically.

Male: tegmina slightly suffused, veins partly dark. Genital segment not unlike *T. flavipes,* but slenderer and more elongate.

Female: tegmina not suffused, veins pale. Genital segments elongate, slightly, obtuse-angularly produced in the middle; pygophor elongate, but much shorter than the ovipositor.

Length 6 (male) 8½ (female) mill.

Hab. Queensland, Nelson (July) Kuranda and Cairns (Aug.).

In a female from Kuranda the crossvein at the base of the inner subapical vein is absent on both tegmina.

5. *iphis,* sp. nov.

Male: vertex luteous, suffused (except basally) with sanguineous. Frons pale luteous suffused with sanguineous, a curved blackish band contiguous to the apical margin of the basal part of the frons; median third of length suffused with fuscous, with curved concentric fuscous lines extending over the yellowish-red ground colour. Genae (excluding a part of the apical margin very narrowly), clypeus and lora blackish. Pronotum and scutellum (except posterior third of latter which is paler) orange-yellow. Tegmina pinkish brown, veins somewhat fuscate, some of them dark fuscous; commissure blackish; apex of apical cells (except the first sometimes) and the appendix, smoky. Sterna and sternites blackish or subsanguineous. Fore and middle legs testaceous, hind pair blackish. Head rounded in front, frons basally and pronotum strongly striate transversely, frons aciculate. Crossvein on brachial sometimes absent; second subapical cell extending beyond at least the third; subapical crossvein oblique.

Female: like the male, but the vertex (excluding the pale greenish or luteous basal margin) is bright redbrown; face black except a small redbrown line on the genae on each side of the frons. Sterna and sternites mostly blackish. Pronotum and anterior two-thirds of the scutellum bright redbrown. Legs testaceous; fore coxae and hind coxae and femora blackish, hind tibiae subapically more or less widely fulvous or pallid. Tegmina dull ferruginous, hyaline subapically, marked as in the male. Last abdominal segment produced, apically subangular, ovipositor a little longer than the pygophor.

Length (male) 7, (female) 7½ mill.

Hab. Queensland, Nelson (July, type) Kuranda and Cairns (Aug.).

6. *io*, sp. nov.

Allied to *T. iphis*, but more robust and with different colour and pattern.

Head, pronotum and scutellum sordid yellowish, frons with a longitudinal submedian dark fuscous fascia (uniting basally acutangularly) with transverse, curved fasciae; sutures very narrowly, base of genae around insertion of antennae, clypeus apicolaterally, sterna and sternites mostly, dark fuscous or blackish. Tegmina pale ferruginous; hyaline, sublacteous on subcostal cell apical of the crossvein, and across the tegmina interiorly in the middle; veins mostly dark fuscous. Legs testaceous, base of femora (and the hind tibiae more or less) fuscous. Vertex scarcely rounded, wider at the eyes than in the middle. Frons elongate, lateral margins sinuate; clypeus strongly carinate. Pronotum strongly striate. Crossvein on brachial nearly straight, on subcostal oblique. Second subapical cell extending apically beyond the others.

Female: genital segments black, much as in *T. fulvus*, but last sternite more acute apically.

Length (male) 6½ (female) 7¼ mill.

Hab. New South Wales, Mittagong (Jan. K).

7. *iambe*, sp. nov.

Allied to the last, but stouter and not so elongate; paler, tegmina milky cinereous, immaculate, except an obscure fuscous spot in some of the cells, veins fuscous, apex of tegmina

infuscate. Second subapical cell extending beyond the others apically; crossvein on brachial, nearly straight, in subcostal cell, oblique.

Male: pygophor pale ferrugineo-testaceous, with blackish bristles; plates elongate, apically acute.

Female: pygopher coloured as in the male, formed as in *T. io,* but not nearly so acutely or far produced in the middle.

Length 6-7 mill.

Hab. New South Wales, Mittagong (Jan. K).

This might be confused with *T. io,* but the stouter form and different genital segment abundantly distinguish it.

8. *ianthe,* sp. nov.

Pale sordid yellowish; vertex, pronotum and anterior two-thirds of scutellum closely spotted with pale yellowish, these spots being clearly but not deeply punctured. Face pale yellowish, obscurely marked with brownish. Pronotum and scutellum fuscate (sometimes the former on the disk only). Tegmina pale yellowish hyaline, immaculate, basal veins pale, apical ones subferruginous, appendix fuscate. Sterna and sternites mostly pale. Tergites blackish along the middle, pale laterally. Head rounded, nearly as long in the middle as laterally. Crossveins on brachial vein and in subcostal cell, straight; subapical cells extending apically about equally far, or the third not quite so far as the others; subcostal cell apical of the crossvein subparallel laterally, apically oblique.

Male: valve practically obsolete, plates not unlike *flavipes.*

Female: genital segments fulvescent above ,varyingly coloured beneath; last sternite strongly produced, apically acute, strongly carinate longitudinally, pygophor elongate (with yellowish bristles), about as long as the ovipositor.

Length (male) 8- (female) 11 mill.

Hab. Queensland, Brisbane (June), Cairns (July-Aug.).

9. *ianassa,* sp. nov.

Female: form of the last, but vertex more emarginate basally without being more produced anteriorly. Head, pronotum and scutellum marmorate with yellowish-white, pale yellowish-brown and brownish, paler on frons. Legs pale, femora and tibiae annulate with brownish. Tegmina yellowish brown, veins

concolorous, crossveins suffused with dark fuscous; longitudinal veins (except subcostal and commissure), multiannulate with dark fuscous, appendix fuscate. Crossveins on brachial vein and in subcostal cell, oblique, the apical part of the subcostal apically elongate and acute, reaching nearly to the apex of tegmina; second subapical cell extending apically farther than the rest. Last sternite nearly truncate, pygophor elongate (with brownish ferruginous bristles), about as long as the ovipositor.

Male: narrower than the other sex. Pronotum not marmorate, brownish yellow with pale, subpunctate spots. Face nearly immaculate (except base of frons), legs almost so. Genital segments not unlike those of *Sarpestus speculatis* in form, except that the apical margin of the last sternite is wider.

Length (male) 8- (female) 9½ mill.

Hab. Queensland, Cairns (July-Aug.).

10. *ianeira,* sp. nov.

Allied to *T. iambe.* Pale yellowish brown, scutellum often tinged with ferruginous. Second subapical cell extending apically beyond the others. Crossveins on brachial and in subcostal fairly straight.

Male: sterna and sternites somewhat fuscate; face almost immaculate; genital segments not unlike those of *T. subniger.*

Females Frons with a submedian pale fuscous longitudinal line with transverse striae. Sterna and sternites pale; last sternite produced, apically acute-angled, pygophor elongate with yellowish-brown bristles.

Length 7 mill.

Hab. New South Wales, Sydney (Jan.-Feb. K), Parramatta (Jan. K).

11. *iokaste,* sp. nov.

Not unlike *T. ianthe,* but smaller, tegmina more pointed apically, head more angulate, &c. Pale sordid yellowish-brown, obscurely suffused here and there with green and sanguineous. Pronotum obscurely spotted. Veins sometimes dark fuscous, sometimes subferruginous. Vertex obtuse-angular anteriorly, longer at eyes than in the middle. Vertex, base of frons, and pronotum transversely striate. Second subapical, cell extend-

ing apically a little beyond the others. Crossveins on brachial vein nearly straight, oblique in the subcostal cell.

Male as in *T. ianassa.*

Female: last sternite straight apically, medianly rather deeply notched; ovipositor long, a little longer than pygophor.

Length 8 mill.

Hab. Queensland, Cairns and Kuranda (Aug.).

The following four species, unknown to me, have been described from Australia:

12 *T. subniger* Signoret, 1880, A. S. E. France (5) X 350, Pl. IV, f. 75 (*male genitalia*).

13 *T. sahlbergii* Signoret, op. c., 351, Pl. IX, f. 76.

14 *T. flavipes* Spangberg; Signoret 1880 op. c., 360, Pl. X. f. 85 (Tasmania).

15 *T. pulchellus* Spangberg; Signoret 1880 op. c., 362 Pl. X. f. 87.

Thymbris gen. nov.

Allied to *Tartessus*, but the vertex is convex and although sharp anteriorly, is not channelled as in the latter. Head and eyes wider than the pronotum; ocelli nearly as far from apex of dorsal part of head as from eyes, on the extreme margin of the head just on the dorsal side, but owing to the declivity of the vertex, is not visible when the insect is horizontal. Eyes not touching base of tegmina. Vertex and pronotum striate transversely. Tegmina narrowed posteriorly, without an appendix.

1. *inachis,* sp. nov.

Pl. II, figs. 19-20.

Female: vertex, pronotum, scutellum and tegmina whitish testaceous mottled with brownish. Beneath obscure testaceous. Veins dull ferruginous-brown, multiannulate with whitish. Fore and middle femora and tibiae annulate dorsally with brownish. Vertex nearly rectangular medianly, longer than at the eyes. Frons elongate, tempora wide, antennal ridges strong. Labium reaching to the base of the middle coxae. Second subapical cell extending apically well beyond the others. Transverse veins on brachial and in subcostal cell, oblique, apical

part of the latter apically acute-angled. Last sternite truncate, transverse, pygophor flattened basally, reaching a little beyond apex of tegmina, not so long as ovipositor.

Male: (of this species?) Head slightly roundly-angulate anteriorly, a little wider at eyes than in the middle. Last segment roundly emarginate, valves about twice as long, elongate triangular.

Length (male) 8- (female) 11½ mill.

Hab. Queensland, Brisbane (Nov., type), Bundaberg (Sept.-Dec., males, female).

2. *iphianassa*, sp. nov.

Male: allied to the last, but differs as follows:

Extreme base of frons pale yellowish white, bordered apically with blackish, narrowly. Tegmina not mottled, immaculate, veins more sparingly annulate with whitish. Legs not annulate. Vertex distinctly angulate, a little wider in the middle than at the eyes. Labium reaching to apex of middle trochanter. Last sternite dark fuscous, truncate, about one-fourth or one-fifth of the length of the pygophor, which widens out a little apically.

Length 8½ mill.

Hab. New South Wales, Sydney (Jan.)

Putoniessa, gen. nov.

Vertex very short, rather longer at the eyes than medianly; margin between this and frons angulate, but the top is actually thickened and a little flattened, an obscure transverse ventral keel at about the middle of the eyes, apparently forming the limit. The ocelli are on this thickened and flattened part, about as in *Thymbris*, and although ventral in aspect, are I think, on the "vertex." Frons narrow, elongate. Tempora wide, antennal ridges rather strong. Vertex and pronotum transversely striate. *Clypeus and genae strongly angulate, the apical part declivous.* Venation as in *Thymbris*, but the apical part of the subcostal cell is longer and reaches the apical margin of the tegmen.

1. *dignissima*, sp. nov.

Pale greyish cinereous mottled with fuscous. Face pale testaceous, frons and clypeus mostly dark fuscous, with pale

specks. Tegmina hyaline, tinged with cinereous, mottled with light and dark fuscous; veins brownish, crossveins mostly whitish. Femora blackish, at least basally and dorsally, fore and middle tibiae annulated with dark fuscous at least dorsally. Sternites dark fuscous, apically bordered with testaceous, narrowly.

Length 8½-9½ mill.

Hab. New South Wales: Mittagong (Jan. K).

This form is a complete link between the "Jassidae" and the "Bythoscopidae" and points the way to the Stenocotinae. It is a melancholy satisfaction to name this in honour of the venerable Dr. Puton, on whom affliction has fallen so heavily.

Xestocephalus.

Xestocephalus Van Duzee 1892 Tr. Amer. Ent. Soc. XIX 298.

A genus noted from America, Ceylon and Japan; I now add two species from Australia and three from Fiji.

Van Duzee has placed it near *Aphrodes,* but he has I think been led astray by the degradation of the wing-venation, which could surely arise independently. Its place seems to me to be near *Phrynomorphus.*

1. *viticnsis,* sp. nov.

Pale yellowish brown, eyes dark fuscous. Tegmina irregularly, brokenly fuscomarmorate, 2 dark spots on the subcostal vein, one near the base and one near the apex of the clavus; one or two of the apical veins suffused at their apices. Wings hyaline, iridescent, veins pale yellowish brown. Subapical cells of tegmen all quadrilateral or 5-hedral, none triangular, the interior cell a little the smallest, exterior slightly smaller than the middle one. Submarginal wing-vein absent on the first fold of the wing.

Female: 7th segment obtuse-angularly emarginate; pygophor rather short, nearly as long as the ovipositor, with pale bristles.

Length 5 mill.

Hab. Viti Levu, Rewa (Mar., Muir).

2. *pallidiceps,* sp. nov.

Yellowish-brown, paler beneath. Tegmina yellowish hyaline, faintly marked with pale cinereo-fuscous, the exterior fourth

with 2 or 3 darker transverse lines and the apical margin pale smoky. Wings hyaline, faintly smoky, veins pale.

Male: last segment apparently roundly emarginate, valve scarcely apparent, plates elongate with concolorous bristles.

Length 2⅝ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

contortuplicatus var. nov.

Like the type, but there is a double line of warm brown from mid-vertex to mid-scutellum, lateral contortuplicate lines of the same colour on pronotum and two blackish brown transverse lines on anterior margin of head. Tegmina rather more marmorate.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

decemnotatus var. nov.

Pronotum with 10 white spots. Tegmina as in *contortuplicatus*.

Hab. Viti Levu, Rewa (Apr., Muir).

These varieties may prove to be good species, but I have seen only a single example of each.

3. *australensis*, sp. nov.

Like the last, but larger and yellower; tegmina with sparse brownish markings.

Length 3½ mill.

Hab. Queensland, Kuranda and Cairns (Aug. P).

4. *purpurascens*, sp. nov.

Head and eyes pitchy brown with a purple tinge, inner orbits narrowly pale. Ocelli pale, very conspicuous. Pronotum and scutellum dark ferruginous brown with a purple glint. Tegmina warm brown with a purple glint, a few irregular pale spots and specks, not corresponding on opposite tegmina. Wings pale smoky, veins fuscous. Labium and fore coxae pale, rest of legs mostly pale fuscous, hind tibiae purplish pitchy. Sterna sordid testaceous. Abdomen purplish pitchy.

Female: pygophor with yellowish brown bristles; last segment notched in the middle.

Length 3 mill.

Hab. Viti Levu, Rewa (Apr., Muir).

5. *sidnicus,* sp. nov.

Blackish-brown; legs pale brownish-testaceous, the hind tibiae with a blackish apical annulus and the apical half of the first and the whole of the second segment of the hind tarsi blackish. Tegmina fuscohyaline, veins blackish, 2 or 3 thin, curved transverse, fuscous lines on the apical fourth of the tegmina. Ocelli orange-brown. Vertex roundly angular in front, one-half longer in the middle than at the eyes.

Length (male) 3¼ mill.

Hab. New South Wales, Sydney (Jan., K.).

Eutettix.

1. *sellata.*

Matsumura (1905 Tr. Sapporo N. H. S., I, 20), thinks this is a synonym of *Acocephalus disciguttu* Walker, a hazardous proposal without seeing the type. Walker's species was from Borneo, and Matsumura has added China and the Philippines.

2. *melaleucae,* sp. nov.

Whitish (tinged with yellowish sometimes on vertex and scutellum), minutely speckled with dark fuscous. Tegmina with most of the veins pale yellowish-brown on head, face, nota, tegmina and legs, the apical ones darker, part of the apex narrowly suffused. Lora remote from the apical margin of the genae. Vertex more rounded and a little shorter than in *E. sellata,* nearly twice as wide as the length. Claval veins united near the base by a cross vein, the anal vein slightly curved, meeting the commissure at an acute angle.

Male: valve short, transverse.

Female: apical margin of last sternite sublaterally emarginate, also minutely emarginate medianly. Pygopher about 3 times as long as last sternite, bristly, widened a little near the base, but narrowing at the base.

Length 4½ mill.

Hab. Queensland, Cairns (July), Nelson (July), Bundaberg (Sept.-Dec.) on *Melaleuca.*

Nephotettix.

All palaeogaeic species.

1 Head and nota not green.....(2)

1a Greenish-yellow; males usually with a black spot on the corium .....4 *apicalis*
2 Tegmina pale yellowish green grey.....1 *curytus*
2a Tegmina not tinged with green.....3
3 Blackish line on vertex straight (or very obtusely-angulate) .....2 *plebeius*
3a Blackish line on vertex arched parallel with the anterior margin .....3 *contemptus*

curytus, sp. nov.

Pl. II, figs. 5-6.

Yellowish testaceous, browner beneath. Tegmina pale yellowish green grey, subopaque, immaculate; membrane subhyaline, pale yellowish, smoky. Vertex a little shorter than the pronotum, about as wide as the eyes together, disk depressed, anteriorly obtusely rounded, a little tumid medianly, a very narrow straight transverse channel between the ocelli. Tempora wide; clypeus a little narrower at base than the apex of the frons, a little constricted immediately apical, thence widening more to the apex. Genae sinuate apically, scarcely angulate laterally, apex of lora practically contiguous with the apical margin of the genae.

Length 5½ mill.

Hab: New South Wales, Mittagong (Jan.) one rather damaged female.

2. *plebeius.*

Pl. II, figs. 3-4.

Hab: add Viti Levu, Rewa (Mar., Muir).

4. *apicalis.*

Pl. II, figs. 11-13.

=*Cicada bipunctata* Fabr. 1803 Syst Rhyng.....
.....(nec. Scopoli 1763.) (=male.)
=*Pediopsis apicalis* Motschulsky 1859 Etud. Ent. 110.....
.....(=female.)
=*P. nigromaculatus* Motsch. op. c., 111 (=male.)
=*T. nigropicta* Stal 1870 O. V. A. F., XXVII 740 (=male).

=*Selenocephalus cincticeps* Uhler 1896 P. U. S. N. Mus., XIX, 292.

Hab: Queensland, (Cairns), Philippines, Riukiu, Formosa, China, Cochin China, Japan, the Malays, (Borneo, etc.), India, Ceylon, Madagascar, German East Africa, Egypt and Morocco on *Oryza sativa* and grasses.

On page 331 (of my former bulletin) I remarked that several species had been confused and indeed, if all the forms before me are one species only, it is very variable. Usually the tegmina are immaculate in the female, and with a large blackish blotch on the corium in the male; sometimes however the tegmina are immaculate in the male, there being gradations between. The genital segments are pale in the female, black in the male; they are however, partly pale in the immaculate males. There is usually a transverse, entire, black line between the ocelli; sometimes this is absent, as in 2 Sinhalese females in my own collection, but it is always present in the long Australian series before me. The frons varies from almost entirely piceous to almost entirely testaceous. The vertex is usually obtusely rounded, it is sometimes however, distinctly angulate.

Soracte gen. nov.

Probably nearest to *Platymetopius,* but the head is not so elongate, the tempora much narrower, the clypeus wider, the lateral margins of pronotum obsolescent and the venation different.

Vertex produced in front of the eyes, apically obtuse-angled, but not quite so long as the maximum width, disk somewhat depressed. Angulate in profile, the ocelli (which are large but flat and probably not functional) close to the eyes on the sharp margin itself. Frons broad, slightly narrowing apically, lateral margins feebly rounded, tempora almost obsolete. Genae sinuate, lora remote from their apical margin. Clypeus broad, narrower than the apex of the frons. Pronotum a little shorter than the vertex, finely striate transversely, acute-angled laterally. Scutellum wider than long. Claval suture longer than the mebrane, the latter with an appendix.

1. *apollonos,* sp. nov.

Brownish-olivaceous; anterior margin of vertex, an upright cross on the same, the lower limb dividing into 2 almost contiguous limbs, 4 longitudinal lines (a submedian and a sub-

lateral on each side) and a median T-shaped line on pronotum, 7 spots on scutellum (2 with an olivaceous speck each in the middle); a median line and numerous concentric, curved, transverse lines on frons; genae, clypeus, and lora (except some olivaceous-brown markings), pale yellowish-testaceous. Abdomen beneath mostly dark olivaceous brown. Tegmina subhyaline, tinged with olivaceous, veins widely colourless, margined narrowly with dark olive brown, sometimes a little suffused, especially the middle apical cell.

Female: last sternite roundly emarginate, the sides bluntly prominent. Pygopher elongate, narrow, with blackish bristles.

Length $4\frac{3}{8}$ mill.

Hab: Queensland, Cairns, (Aug., one female.)

Deltocephalus.

This seems to be characterized by a long, pointed vertex, frons longer than wide, tempora narrow, often obsolete basally, venation more complex.

2. *lotis,* sp. nov.

Vertex piceous with a thin median longitudinal testaceous line, basal half testaceous with two big piceous spots, a short transverse testaceous line on middle of apical half. Face piceous, frons with curved concentric lines on each side of the middle, irregular apically. Legs mostly piceous, fore and middle tibiae testaceous, suffused irregularly with piceous. Tegmina testaceous subopaque, with narrow piceous margins to the veins on both sides. Abdomen above piceous with about 5 rows of testaceous spots, below mostly piceous. Greatest width of vertex about the same as the length, vertex flattish, nearly rectangled apically, a little depressed basally. Vertex and frons acute-angled in profiile. Tegmina reaching to about half the length of the insect, obliquely transverse apically.

Length $3\frac{5}{8}$ mill.

Hab. New South Wales, Mittagong (Jan. K.) one female.

3. *D. polemon,* sp. nov.

Closely allied to *D. sylvestris* Osb. & Ball, but venation and genital segments different.

Vertex testaceous, with a faint olivaceo-fuscous stripe on each side of the median line, terminating apically in a fuscous speck. Face piceous, frons with 5 or 6 thin, concentric, curved,

inwardly abbreviated pale yellowish-brown lines. Pronotum testaceous, with 3 longitudinal pale olive-fuscous stripes on each side, the innermost broad and continuing on to the scutellum. Tegmina dilute yellowish cinereous, veins whitish testaceous, narrowly and irregularly margined with fuscous, apical cells mostly dark fuscous, the first and second apical veins whitish. Sterna and abdomen mostly dark fuscous or piceous, marked with pallid.

Male: valve short, triangular; plates little longer than the valve, the two taken together deeply emarginate angularly in the middle; pygophor more than twice as long medianly as the plates.

Female: last sternite roundly emarginate, bluntly anguiate at the sides; apex of pygophor pale, with particoloured bristles (yellow and dark fuscous.)

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Cairns, (Aug.)

Sometimes the vertex and pronotum appear as though pale olivefuscous with pale lines.

4. *histrionicus*, sp. nov.

Vertex, pronotum and scutellum yellowish creamy, underside and tergites with a brownish tinge; anterior margin of head with two intersecting black curves; anterior two-thirds of pronotum (except laterally) suffused with ferruginous, a broken, angular, fuscous line at the base of this suffusion. Scutellum with a ferruginous spot at each anterolateral angle. Tegmina pale creamy whitish, tinged with ferruginous along the corial half of the clavus and on most of the apical half of the corium; subcostal cell yellowish creamy with the following dark fuscous markings, viz: a St. Andrew's Cross on the basal two-thirds (the basal right and apical left limbs being irregular) subcostal cell with 3 elongate spots, the third uniting with the St. Andrew's Cross; on the apical third there is an oblique sinuate line from near the apex of the clavus to near the apex of the subcostal, then curving round the apical margin, nearly reaching its starting point and enclosing a large spot. Wings hyaline, veins pale.

Female: last segment slightly notched medianly, pygophor yellowish, apically marked with black.

Length $3\frac{1}{8}$ mill.

Hab. Viti Levu (Mar. Muir's No. 143), on a native tree in the bush.

5. *lucindae,* sp. nov.

Male: white tinged with yellowish brown; frons with a dark suffused radiating pattern visible dorsally as 2 oblongs and 2 specks on the anterior margin of the vertex; margins of face brown. Pronotum and scutellum obscurely mottled. Legs annulate. Tegmina much as in *Conosanus hospes*. Abdomen beneath pale medianly, dark laterally. Valve pale, very large, semicircular, nearly as long as the plates, which are apparently about as long as the pygophor.

Female: (of this?) darker and more suffused. Abdomen below dark fuscous. Last segment deeply roundly excavate, pygophor dark speckled with pale, a little longer than the ovipositor.

Length (male) 3⅞ (female) 5 mill.

Hab. Queensland, Lucinda (July K).

6. *flavidiventris.*

Jassus (*Deltocephalus*) *flavidiventris* Stal 1859 Eugenies' Resa Ins. 294.

I do not know this species, laconically described from Sydney.

I agree with Van Duzee that his *Deltocephalus osborni* belongs to this genus and not to *Phrynomorphus*, as is indeed apparently the case with all the species placed by Osborn & Ball in *Commellus*.

Phrynophyes.

Phrynomorphus fatigandus cannot be placed in *Phrynomorphus* as restricted, it is nearer *Phrynophyes*. The elongate frons, vertex longer than wide and acuteangled apically, remove it from *Phrynomorphus* (even *sens. lat.*), while the venation is too simple for *Deltocephalus*. It has the characters somewhat of *Stirellus* but is very different from *S. curtisii*, the only species I have for examination; moreover *Stirellus* seems to merge gradually into *Deltocephalus*.

Driotura.

Dritotura O. & B., 1898, Proc. Davenport Ac. Nat. Sc. VII, 87.

1. *aristarche,* sp. nov.

Pl. II, figs. 9-10.

Probably allied to *D. robusta* O. & B.., but the head is longer and more angulate, and the tegminal reticulation coarser.

Male: vertex whitish-testaceous, heavily barred with piceous, frons whitish-testaceous, with curved concentric lines, which are much broader than the interstitial paleness; genae, clypeus and lora whitish-testaceous with a large dark fuscous spot on each. Anterior half of pronotum dark fuscous with a few tiny testaceous markings, posterior half whitish. Tegmina fuscous, veins margined both sides with piceous, apical margin broadly whitish. Fore and middle femora piceous, multi-annulate with testaceous, hind femora testaceous with irregular, longitudinal, fuscous stripes. Abdomen piceous with 4 or 5 rows of tiny testaceous specks, last tergite with the apical margin whitish-testaceous.

Female: head testaceous, suffused with pale fuscous. Vertex not quite as long as wide, angulate, a large dark fuscous spot on each side of the middle near the base, and interior to these a short dark fuscous line on each side a little anterior. Pronotum whitish, anterior half testaceous with fuscous markings. Tegmina whitish varying to fuscous with white apical margin. Abdomen above fuscous and whitish testaceous, almost irrorate. Abdomen below dark fuscous with a few testaceous markings. Frons brownish testaceous with dark fuscous curved concentric lines not touching medianly. Genae, lora and clypeus brownish testaceous, each with a fuscous spot. Legs as in the male.

Length 2 (male) to 2½ (female) mill.

Hab. New South Wales, Mittagong (Jan.).

Phrynomorphus.

This genus, in its most restricted sense, seems to be strictly synonymous with *Athysanus* Burmeister; the genus (for my purposes) has a transverse vertex, which is not longer than the pronotum, frons wide, wider at base than long, wide tempora and simple venation. The males have a valve. *P. taedius* is, I think, the only species of those I described in the first memoir that may be considered to belong here (*sens. strict.*)

In the subgenus *Conosanus*, with different head form, may perhaps be placed the following:

2. *longinquus.*

3. *hospes.*

Pl. I, figs. 13-17.

Deltocephalus hospes Kirkaldy 1904 Entom. 177

Originally described as an immigrant into Hawaii, it is now recorded from the whole of Eastern Australia (at least) and the lowlands of Fiji.

The *ova* are not remarkable, being of the usual Phrynomorphine type of Grass-feeder and are inserted in the usual way in the leaves of *Cynodon dactylon* (the "Dog's tooth grass" of England, and the "Maniania" of the Hawaiians).

The *last nymphal instar* (Pl. I., f. 13) is of the form of the adult, pale testaceous, with 4 olive-brown longitudinal lines, the 2 lateral terminating anteriorly at the eyes. There are about 24 black bristly hairs, 3 on almost each segment, arranged in 3 longitudinal rows, one submedian, one sublateral and one lateral. The anterior margin of the vertex is narrowly white with faint fuscous marks and a very narrow anterior line of fuscous. Frons with fuscous transverse lines from a pale central line, on the basal third. Clypeus faintly fuscous; labium black-tipped, reaching to the fore trochanters. Femora brokenly banded with dark fuscous or blackish, tibiae and tarsi dark fuscous or blackish at base of some of the bristles (especially the larger ones). The 2 or 3 apical abdominal segments laterally fuscous. Eyes greenish. Antennal flagellum reaching to about the middle coxa.

The *other nymphal* instars do not differ appreciably except that the frons is pale.

4. *chlorippe,* sp. nov.

Very similar in appearance to *Deltocephalus abdominalis* (Fabr.).

Bright yellow, tegminal veins concolorous. Frons pale brownish, obscurely suffused with darker tint, and with slender, concentric, curved, dark fuscous lines. Genae, lora, clypeus, &c., pallid, the last named a little fuscate medianly. Metanotum, sterna, (mostly) and basal half of abdomen above and beneath (except the lateral margins) blackish. Basal half of fore and middle femora blackish, hind femora dorsally black (except apex), hind tibiae longitudinally lined with black. Vertex triangular, as long in front of the eyes as behind, wider than long,

sulculate entirely, flat. Ocelli remote from the eyes. Frons longer than wide, with a small tubercle at the base medianly, a little wider apically than the clypeus basally; lora nearly touching the genae apcally; tempora narrow. Tegmina short, without appendix; not reaching apex of abdomen, apically rounded, only one subapical cell.

Female: last segment produced a little triangularly (very obtusely) in the middle; the pale brownish ovipositor is much longer than the elongate pygophor.

Length $3\frac{1}{3}$ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., Koebele).

Vars: the frons varies from piceous to pallid. This is a pretty little species and rare.

Thamnophryne, gen. nov.

Differs from its allies by the minutely but deeply, completely, punctured pronotum; otherwise differs from *Thamnotettix* by the very short lateral margins of the pronotum.

1. *nysias*, sp. nov.

Head pale brownish-testaceous; vertex irregularly suffused with fuscous; frons with a few concentric curved fuscous lines which are often much abbreviated towards the middle of the frons, often almost obsolete. Base of genae (around the antennae) dark fuscous. Pronotum dark fuscous, yellowish-brown laterally, comparatively thickly, but irregularly, punctured with yellowish-brown. Tegmina milky hyaline, veins dark fuscous, many of them more or less suffused, especially the crossveins at the apex of the subcostal cell, and the apical veins apically. Many of the cells with a more or less elongate fuscous spot in the middle, the brachial cell with two. Legs testaceous, hind tibiae with blackish spots at the base of the bristles. Sterna and abdomen below mostly dark fuscous. Vertex short, rounded, apically, forming a curve with the eyes which are rather wider than the maximum width of the vertex. Frons longer than wide, tempora very narrow, almost obsolete. Clypeus as wide basally as the frons apically, constricted a little just apical of the base, widening as much towards the apex.

Male: genital segments strongly tufted.

Length $4\frac{1}{2}$ mill.

Hab. New South Wales: Mittagong (Jan.)

A male example from Queensland, Bundaberg, with the tegmina more suffused with olivaceous, and the genital segments not tufted, may form another species.

Lonatura.

Lonatura Osborn & Ball 1898 P. Davenport Ac. Sci., VII 83.

1. *austrina,* sp. nov.

Closely allied to *L. catalina* (which I presume to be the type), but the head is distinctly longer and the tegmina only reach to the base of the genital segment. Head, pronotum and scutellum pale yellowish, the frons with a pale ferruginous radiating pattern. Tegmina pale olive-green, the veins a little yellow, a broad smoky apical band. Abdomen black, the last segment white, pygophor white and black. Legs yellowish brown soiled with fuscous.

Length $1\frac{7}{8}$ mill.

Hab. New South Wales, Sydney (Feb., K.); Queensland, Bundaberg (Sept.-Dec. P).

This tiny species is allied to *L. catalina* by the venation, but there is apparently no appendix; and to *L. megalopa* by the frons being longer and basally more angular and by being patterned, also the lora are remote from the apex of the clypeus.

Allygus.

Allygus Fieber 1875 Rev. Mag. Zool. (3) III, 410.

1. *lotophagorum,* sp. nov.

Yellowish-testaceous, marbled with olive-brown on pronotum. Vertex with a mark and 6 spots in olive brown. Ocelli orange-red, very conspicuous. Frons yellowish-testaceous, strongly and broadly marked with a black radiating pattern. Genae yellow, margined apically with black and a median black spot. Clypeus and lora black, the former with 2 short pale lines, the latter with a pale spot each. Tegmina milky hyaline, closely marbled with olive-brown, but in parts only, so that there are 3 milky spots along the commissure on the clavus, and 5 or 6 on the corium, the latter less distinct; nodal veins suffused. Legs black with pale bristles, apical half of fore femora black, the

fore and middle tibiae spotted with the same, all the tarsi partly pale. Abdomen mostly black.

Male: genital pieces narrowly margined apically with whitish-testaceous and with white bristles.

Female: pygophor black, with white specks and white bristles on the apical half.

Length 3 mill.

Hab. Viti Levu, Rewa (Mch.-Apr., M), Ba (Jan., M.). A pretty little species.

Limotettix.

On reconsideration, I think I have made a mistake in sinking this name. The whole affair is in a great muddle, hinging largely on the equally muddled *Cicadula*, of which the type is really, as ascertained in my former memoir, *smaragdula*. Sahlberg's *Limotettix* was heterogeneous; apart from one or two disputed species, variously assigned to *Phrynomorphus, Deltocephalus* &c., (all prior genera), it is comprised of two main sections, (1)=a section of the *Thammotettix* of Puton's Catalogue (1899) and (2)=*Macrosteles* Fieber (=*Cicadula* Puton). As Woodworth has declared the type to be *quadrinotata* (Fabr.) i. e. of the species of the first section, and as Edwards (1896) also uses it in the same sense, it is perhaps proper to keep it so, with *Euleimonios* as a synonym.

2. *filicicola,* sp. nov.

Pale luteous, paler beneath, pronotum tinged with brown. Anterolateral margins of vertex broadly black (meeting angulately at apex). Pronotum with 4 dark fuscous lines, the two middle of which continue on to the scutellum. Tegmina with a nearly entire, dark fuscous, longitudinal median line, 2nd to 4th apical cells hyaline, veins dark, apical margin of the first suffused and a spot in the middle of the cell. Wings hyaline, veins fuscous. Abdomen above more or less fuscous.

Male: genital segments short, concolorous.

Female: last segment apically black, roundly emarginate; pygophors pale brownish ferruginous, elongate; ovipositor black, much longer than the pygophors.

Length (male) 3 (female) 3⅛ mill.

Hab. Viti Levu, (Nov. Muir's No. 15), Rewa (Apr. M.), on tree-ferns.

3. *tachyporias,* sp. nov.

Superficially somewhat like the last.

Pale yellowish, tergites and the underside paler. Frons basally and the lateral angles of pronotum blackish brown. Tegmina hyaline with an entire longitudinal, blackish brown median stripe. Vertex rounded (slightly angulate) extending in front of eyes, a trifle longer than wide at base.

Male: 7th segment subtruncate; valve narrow, semicircular; plates pointed, lateral margin sinuate, scarcely as long as pygophor.

Female; 7th segment very slightly produced in the middle.

Length 3⅞ (male) 4 (female) mill.

Hab. Queensland, Bundaberg (Sept.-Dec. K.).

4. *capitatus,* sp. nov.

Head, pronotum and scutellum pale yellowish brown; vertex with 2 large metallic blue black spots; face tinged with ferruginous; a blackish spot on each side just apical of the antennal scrobes. Tegmina hyaline, faintly smoky, except the subcostal and the 3rd and 4th apical cells. Wings hyaline, veins pale fuscous. Legs pale yellowish brown. Underneath dark fuscous or blackish brown. External subapical cell longer than the interior.

Female: 7th segment roundly produced; pygophors fuscous with shortish yellow brown bristly hairs; ovipositor black.

Length 3 mill.

Hab. Queensland, Cairns, (Aug. P.).

Pettya

1. *anemolua.*

The wingvein is like that of *Balclutha,* except that there is no submarginal vein.

Nesosteles

The first two wings veins are confluent towards the apex. The genus is very close to *Balclutha.*

1. *hebe.*

Add: Viti Levu, Rewa (Mar., Apr., M.) and Navua (Feb. M), and I think the same species is at Bundaberg (Sept.-Dec.),

Cairns (July) and Lucinda Point (July) in Queensland, but these species are difficult to separate.

2. *glauca.*

The vertex is shorter than in *N. hebe,* more convex and not flush with the pronotum. I think this also occurs at Kuranda.

6. *dryas* sp. nov.

Allied to *N. sordidior,* but smaller and paler. Head testaceous, more or less suffused with pale orange-brown, a short longitudinal suture and a lateral impression, reddish-brown. Pronotum creamy, with 3 thin orange-brown longitudinal lines continued (more widely) on to the scutellum. Tegmina creamy, veins white, the first two apical veins margined with fuscous. Wings milky hyaline, veins on the apical third mostly fuscous. Sterna, legs, and sternites creamy with a tinge of brown. Tergites black, last segment pale.

Male: Pygophor pale.

Female: last segment sinuately angularly emarginate, lateral angles acute; pygophor elognate.

Length 4½ mill.

Hab. Queensland, Redlynch (July), Cairns (July, Aug.), Bundaberg (Sept.-Dec.).

7. *aurantiigera,* sp. nov.

Head, pronotum and scutellum pale greenish-yellow. Tegmina and legs orange-red, the former with conspicuous whitish-veins, the apical cells hyaline. Wings milky. Tergites fuscous, hind margin of the segments pale yellowish. Vertex rounded in front, less than half the length of the pronotum, about as long medianly as at the eyes.

Length 4 mill.

Hab. Queensland, Cairns (Aug., P.).

The two following species probably do not belong to *Nesosteles,* but as some of the species of that genus approach *Balclutha* (of which I know only one species), I prefer, for the present, to include these two in *Nesosteles.*

8. *phryne,* sp. nov.

Creamy testaceous, basal four-fifths of abdomen dark fuscous. Tegmina hyaline milky, veins creamy. Wings hyaline, veins on apical half pale fuscous. This differs from typical *Nesoxteles* by the radial vein being scarcely obsolescent, and by the vertex being as long as wide between the eyes, nearly as long as the pronotum, angularly produced, nearly twice as long in the middle as at the eyes.

Length 4 mill.

Hab. New South Wales, Mittagong (Jan., K).

9. *chloe,* sp. nov.

Bright-green. Tegmina hyaline, veins green. Wings and wing-veins hyaline. Vertex roundly angulate anteriorly, a little shorter proportionately than in *N. phryne.*

Length 4 mill.

Hab. Queensland, Kuranda (Aug., P.); New South Wales, Sydney (Feb., K.).

Euterygini.

Further study has necessitated the reduction of this group from subfamily to tribe. I am unable as yet to give a circumscribed diagnosis, owing to the inclusion of *Aneono* and *Dialecticopteryx,* but have not seen a specimen of any form where the basal part of the tegminal venation is clearly interpretable; apparently, however, the 3 main veins either spring together out of the basal cell, or the radial and median have a short stalk. (*) There seem to be four apical tegminal-cells, but often the first is obsolescent or even entirely absent. *Aneono* and *Dialecticopteryx* belong here by habitus, but have peculiar venation. The following table seems to bear a closer approximation to the natural affinities of the forms than that in my first memoir.

1 The 3 main veins of the tegmen running separately to the apical cells, or only joined quite close to the base...(2)
1a Median and cubital veins united by a stalk apically...(13)
2 Face of the usual type .....(3)
2a Frons closed basally .....(12)
3 Three apical wing cells [Group A].....(4)

* Woodworth's figure of an Eupterygine tegmen (1906, Techn. bull. Univ. California Ent. I f. 61, is unlike any I have seen.

3a Two apical wing cells [Group B] (**).....(6)
3b One apical wing cell [Group C] (**).....(11)
4 Tegminal appendix present.....(5)
4a Tegminal appendix absent, submarginal wingvein present .....(10)
5 Submarginal wingvein present.....1 *Alebra*
5a Submarginal wingvein absent.....2 *Protalebra*
6 Submarginal wing vein present; third apical wingvein forked .....(7)
6a Submarginal wingvein absent.....(9)
7 At least two of the apical cells of the tegmen arising from the transverse veins .....(8)
7a Only one of the apical cells arising directly from the transverse veins .....5 *Kahaono*
8 Body long and slender .....3 *Dikraneura*
8a Body short and robust.....4 *Erythria*
9 First two wing veins subparallel.....6 *Eupteryx*
9a First two wing veins confluent towards the apex..... .....7 *Erythroneura* (=*Empoa*)
10 Vertex twice as long as pronotum.....8 *Nirvana*
10a Vertex shorter than pronotum .....9 *Eualebra*
11 Submarginal wing vein present. 10 *Cicadula* (=*Empoasca*)
11a Submarginal wing vein absent.....11 *Typhlocybella*
12 Vertex wider than an eye, not produced anteriorly, forming a curve with the eyes; frons not twice as long as maximum width .....12 *Apheliona* (type *Heliona biocula Melichar*)
12a Vertex narrower basally than an eye, angularly produced anteriorly; frons elognate, more than 3 times as long as maximum width; lora elongate.....13 *Heliona*
13 Vertex not produced in front of eyes; radial and median with a common apical stalk .....14 *Dialecticopteryx*
13a Vertex triangularly produced; cubital and median with a common apical stalk .....15 *Aneono*

It appears to me that a form with three apical wing cells and a tegminal appendix represents the most generalized, degradation to two and then to one wing cell results in Groups B and C, the former first having a submarginal wing vein, then losing that.

** Not counting the supernumerary cell.

Alebra seems to represent very fairly the more primitive forms and I imagine it more likely that *Protalebra* has been developed from a form like *Alebra* than *vice versa*. *Alebra*-like forms by losing the submarginal vein that is to say, the apical margins of the apical veins, develop into *Zygina*, *Eupteryx*, etc. I have no specimens now of *Nirvana* for examination, but judging from Melichar's figures, it is very likely to be an Eupterygine genus.

Cicadula.

2. *viticnsis*.

Line 9 of description, for "with" read "wing."

Hab. Viti Levu, Rewa (Feb. Mar. Nov. & Dec., M.).

One example is pale yellowish-green (instead of lemon-yellow) and the legs are green (instead of pale greenish); this, no doubt, is the colour when alive. The last segment of the female is practically truncate apically. The ocelli are fairly well pronounced and lie within the pale oblong, bordered by the two dark transverse lines, on the top of the head.

3. *hyadas* sp. nov.

Pale lemon yellow, paler beneath. Eyes greyish-black. Tegmina milky, a short dark fuscous line on the apical margin at the basal internal angle and a greyish fuscous spot at the apex of the tegmen. Wings milky, veins partly fuscous. Vertex about as long as the scutellum, shorter than the pronotum, nearly twice as long medianly as at the eyes, angularly rounded in front.

Female: ovipositor black.

Length 3⅛ mill.

Hab. Viti Levu, Rewa (Dec., M.).

4. *euryphaessa* sp. nov.

Allied to *C. rufa* (Melichar), but the head is longer, pronotum shorter, legs pale, etc. Bright scarlet; vertex pale testaceous with a mediolongitudinal suffused scarlet stripe, which forks at the base of the frons and extends all over the face suffusedly (sometimes the red stripe is obsolete at the fork, the frons then being entirely pale, only the genae and the clypeus, etc., red.) Apical third of tegmina hyaline, iridescent, veins there pale yellowish. Wings hyaline, iridescent, basal veins pale sanguineous.

Tergites mostly sanguineous. Underside and legs pale testaceous, the former sometimes a little suffusedly sanguineous. Vertex longitudinally sulculate, anteriorly somewhat swollen, longer than wide, roundly produced before the eyes. Pronotum scarcely wider than the head and only about one-half of its length, shorter than the scutellum, scarcely emarginate posteriorly, lateral margins short. Tegminal venation that of *C. rufa,* except that the interior branch of the first apical vein is curved.

Female: last sternite very slightly sinuate, the pale part longer than wide.

Length 2½ mill.

Hab. Viti Levu, Rewa (Mar.-Apr.) Navua (Feb. Muir's No. 53) on a native tree, also on *Saccharum officinarum.*

There is a purplish bloom on one example, giving it a superficial resemblance to *Erythroneura doris.*

Erythroneura.

6. *sidnica,* sp. nov.

Pale yellowish, immaculate, paler beneath. Head shaped as in *E. dentata* (Gillette), but more rounded and the eyes more decumbent on the pronotum, which is posteriorly slightly emarginate.

Length abt. 3 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

In bad condition.

7. *doris* sp. nov.

Distinguished by the large pronotum and minute scutellum, as well as by the colour.

Head, pronotum, sterna, legs, etc., pale testaceous. Pronotum laterally from antero-lateral angle of the scutellum to the intero-posterior angle of the eye, dark fuscous. Scutellum testaceous tinged with pale purplish blue. Tegmina pale sanguineous, tinged with violaceous, basal two-thirds of subcostal and subradial cells purplish, apical third of tegmina hyaline, veins pale sanguineous. Wings hyaline, iridescent, tinged with fuscous, veins dark. Abdomen dark fuscous. Vertex wider than long, extending nearly as far in front of the smallish eyes as basally, angularly rounded apically. Pronotum large, a little wider than the head,

and longer than the vertex, about one-half wider than long, lateral margins long, anterior and posterior margins subparallel. Scutellum minute, not one-half the length of the pronotum.

Length (female) $2\frac{1}{3}$ mill.

Hab. Viti Levu, Rewa (Apr., Muir).

8. *lalage*, sp. nov.

Allied to the last, but head shaped differently, scutellum longer and different colour. Head, sterna and legs pale testaceous, the vertex with a large dark fuscous spot arising close to the base and extending on to the frons nearly as far apically as in line with the insertion of the antennae. Pronotum anteriorly obscure purple, posteriorly dark fuscous, an obscure fuscotestaceous line mediolongitudinally, extending on to the obscure-purplish scutellum. Abdomen dark fuscous. Tegmina and wings as in *E. doris*. Eyes a little larger; vertex more rounded on the anterolateral margins, wider than long. Pronotum as in *doris*, but a little shorter and the anterior margin a little arched. Scutellum at least three fourths of the length of the pronotum.

Female: base of genital segment obscurely pale.

Length $2\frac{1}{3}$ mill.

Hab. Viti Levu, Rewa (Apr., Muir, 1 female).

9. *leucothoe*, sp. nov.

May be regarded as a "*Zygina*," although there are three subparallel apical veins, the first diverging a little outwards, and being a direct continuation of the radial, more approaching *Dikraneura* from which it differs only by the absence of the submarginal. Pale whitish testaceous; tegmina milky white, (a large opaque area occupying middle third of subcostal cell), veins concolorous; a blood-red spot at the base of the second apical vein and a tiny blood-red speck at the apex of the clavus. Vertex produced well in front of the eyes, about as long as wide, roundly angulate. Pronotum anteriorly rounded, about as long as the vertex and a trifle longer than the scutellum. Eyes not nearly touching base of tegmina. Radial and median veins apparently unite at about the apical margin of the basal third of the tegmen.

Length (female) 2 mill.

Hab. Viti Levu, Navua (Feb., Muir).

10. *rewana,* sp. nov.

Yellowish-brown, paler beneath, pronotum somewhat sordid, abdomen blackish. Tegmina smoky hyaline; clavus, sutural cell of corium and subcostal cell, pale yellow smoky in parts; veins pale yellow; a dark smoky spot at apex of tegmen. Wings smoky hyaline, veins smoky. Vertex somewhat convex, roundly prominent in front of eyes, but not so long as wide. Four apical cells to the tegmen, the first very small.

Length 2⅓-2½ mill.

Hab. Viti Levu, Rewa (Mar. & Dec. M.).

The yellow is apt to fade and become obscure.

Nymph: The ultimate stage (as far as can be judged from the empty skin) is brownish-yellow. Head produced in front of eyes at least as far as the length of the rather long eyes beyond them. Antennal peduncle elognate and conspicuous, flagellum much longer than the body. There are a large number of erect capitate hairs disposed as follows: 6 on the lateral and anterior margin of the vertex 4 on the pronotum, 8 submedian and 6 lateral on the abdominal tergites, also a number on the meso and metanotum, tegminal pads and legs.

Dialecticopteryx, gen. nov.

An aberrant genus, distinguished by the peculiar venation of tegmina and wings.

Vertex transverse, declivous, anteriorly rounded, not (or scarcely) prominent in front of eyes, longitudinally sulculate, posteriorly marginate and raised from the pronotum. Pronotum transverse, little longer than the vertex, lateral margins short, carinate. Scutellum longer than wide, about as long as the pronotum. Tegmina (Pl. 1, fig. 7) sparsely punctured, venation obscure; the radial and median are united at the base, fork soon after, but keep very close together till a little basal of the apical calls when they reunite; cubital obsolete basally, only appearing a little basal of the apical cells. The radiomedial reforks apical of the subapical line, thus forming a triangular cell; there are 2 quadrilinear cells interior of this (perhaps more if the apical veins fork). No veins in the clavus and no appendix. The extreme apex of the wing is unfortunately broken but enough remains to show its peculiar character (see Pl. 1 fig. 6). This genus shows some relationship to *Nesosteles,* etc.

1. *australica*, sp. nov.

Pl. 1. figs. 6-7.

Orange-yellow, legs paler; 2 large bluish-black round spots on the vertex and a smaller one on the frons. Pronotum with an inverted blue-black V, connecting on the scutellum with an inverted A. Tegmina milky white, subcostal vein basally, radial, median and commissure suffusedly smoky, extreme margins of tegmen here narrowly black; radiomedial (apical) and continuation of the commissure apical of the clavus, smoky but not suffused. Wings hyaline, iridescent, veins pale fuscous partly.

Male: plates long, triangular taken together.

Female: 7th sternite triangularly produced, pygophor yellowish brown, ovipositor dark fuscous.

Length 4½ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

Tribe *Cephalelini*.

This is only a small part of the tribe of this name in my first memoir. It is restricted to those forms in which the tibiae are very feebly bristly; owing to a degradation of the flight organs, the tegminal and wing venations are usually much reduced. Incidentally the head is usually greatly elongate and foliaceous or subfoliaceous.

Cephalelus, Dorycephalus, Paradorydium, and others not known to me in nature, as *Dorydiella,* belong to this tribe.

Paradorydium.

4. *brighami*, sp. nov.

Distinguished from the other species by the short vertex.

Pale yellowish, closely punctured with light brownish, the punctures being closer and darker on the basal half of the pronotum. Head close around insertion of antennae, the labium, sterna, etc., dark fuscous. Sternites (except the last segment which with the genital segments is pallid) infuscate. Fore femora ringed with fuscous. Vertex acute anteriorly, lateral margins straight, Frons anterior to the antennae diamond-shaped, then the lateral margins parallel, the insertion of the antennae about on a line with the apical margin of the eyes (instead of distinctly nearer the ante-

rior angle of the head); apical margin of clypeus minutely notched, extending apically distinctly beyond the apical margin of the genae.

Male: vertex nearly twice as long as pronotum; maximum width greater than median length.

Female: vertex about twice and a half as long as the pronotum; maximum width less than median length.

Length 3½ mill.

Hab. New South Wales, Mittagong (Jan., K.).

This species, (which I name in honour of Dr. W. T. Brigham, Director of the Bernice Pauahi Bishop Museum in Honolulu, whose "Index to the Islands of the Pacific" (1900 Mem. Bishop Mus. I, 1-172) is of such great value to the student of Pacific Faunas), seems very distinct from such *Paradorydia* as *lanceolatum, foveolatum,* etc., but I can see no generic differences beyond the much shorter head. On this and the straight lateral margins of the vertex, I found a new subgenus *Deltodorydium.*

5. *ovidii* sp. nov.

Allied to the last, but the head more elongate, the head and pronotum forming two-fifths of the entire length, and the lateral margins are concavely curved, the species thus falling into the typical subgenus. It differs from *P. foveolatum* Sign., by the much less spatulate head and less pointed tegmina.

Length (female) 5 mill.

Hab. New South Wales, Mittagong (Jan.).

Dorycephalus.

3. *trilineatus.*

The exact habitat was "New South Wales, Sydney (Jan., K.)."

Tribe *Iassini.*

Van Duzee includes this as a tribe of his Jassina, but it is far more distinct from his 'Deltocephalini' than these are from his 'Subfamily Acocephalina.' The Iassinae are characterized by the vertex being perpendicularly raised at the sides and base, the latter being practically truncate between the eyes, and distinctly narrower there than the apical margin of the scutellum. Head and eyes distinctly narrower than the pronotum. Frons

elongate. Wings with a supernumerary cell. There is only one subapical cell in the tegmen (*). The ocelli are well-marked and are on, or near, the apical margin of the vertex and are visible dorsally. In the 3 genera known to me, the vertex is obliquely striate, the pronotum finely granulate and the scutellum very finely punctured. The female genital segments are of the usual Tetigoniine type, but the male plates are very long and of characteristic appearance; the valve is wanting.

The structure of the head, of the venation and of the male plates distinguish this group very thoroughly. *Macrocratogonia* has some affinity with these forms, but only females are known at present; the interior discoidal cell is also divided by a transverse vein in both the specimens I have seen. It has also great affinity with the Tetigoniini and Penthimiini, but must at present be relegated to a provisional tribe by itself.

Eight genera of Iassini are known.

1 Vertex more than twice as long as wide, triangular produced ..... 3 *Muirella*

1a Vertex not longer than wide ..... (2)

2 Fore femora and tibiae foliaceous ..... 8 *Gabrita* (=*Petalopoda*)**

2a Femora simple ..... (3)

3 Pronotum keeled ..... 7 *Thagria*

3a Pronotum not keeled ..... (4)

4 Vertex expanded posteriorly behind the eyes; ocelli near the apical margin of the vertex; anterior and posterior margins of the pronotum subparallel ..... 5 *Tinobregmus*

4a Vertex not expanded behind the eyes ..... (5)

5 Ocelli near the eyes; anterior margin of pronotum rounded ..... (6)

5a Ocelli remote from the eyes; anterior margin of pronotum straight ..... 6 *Neoocellidia*

6 Scutellum much shorter than pronotum ..... 4 *Palicus*

6a Scutellum not shorter than pronotum ..... (7)

7 Anterior tibiae curved ..... 3 *Terulia*

7a Anterior tibiae straight ..... (8)

8 Frons rather flat, distinctly sutured; tempora wide but short; antennae inserted near the intero-posterior angles of the eyes ..... 1 *Iassus*

* It is true there are two in *Tharra labena*, but in the unique type of this, the exterior discoidal cell is divided apical of its middle by a short transverse vein, which is absent in the other species of the genus.

** There is nothing in the descriptions of these to keep them apart.

8a Frons raised, less distinctly sutured, tempora narrow and very short, antennae inserted near the intero-anterior angles of the eyes .....2 *Tharra*

Tharra.

I separated this (Bull. I p. 324) from *Iassus* by the possession of two subapical cells and the absence of transverse veins in the clavus; the latter is of no value and the former is, I am inclined to believe, accidental. It is possibly only a group of *Iassus*, but for the present may be separated by the characters given in the key. Typical *Iassus* also seems to have the apical margin of the vertex forming more or less of a curve with the eyes. The only species of *Iassus* I have seen is represented by a pair of *I. olitorius* Say, kindly given me by my friend, Mr. Van Duzee.

In *Tharra labena, kassiphone,* etc., the median and brachial veins are generally united by a straight cross vein at their bases, this being united to the radial by an outwardly inclined oblique vein; but in *T. kalypso* and *ogygia* there is usually a common longitudinal stalk for the median and brachial, which is united to the radial by the oblique vein. This however is not constant and moreover sometimes the stalk vanishes, and the median and brachial unite at an angle.

In all the species, the frons is not, or only faintly, medianly keeled and the clypeus is not ampliate, though often a little widened, apically.

The species (all Australian and Fijian up to the present) may be disposed as follows:

1 Vertex distinctly narrower at the base than at the anterior margin of the eyes, not flush with the eyes, lateral margins gradually divergent. Anterior and middle legs bright orange yellow..... 5 *kassiphone*

1a Vertex little wider (if at all) at anterior margin of eyes than basally, flush with the eyes, lateral margins parallel or subparallel as far as the anterior margins of the latter. Legs pallid or black 2

2 Part of vertex produced before eyes not more than a third of the length of the basal part 3

2a Part of vertex produced before eyes about two-thirds of the length of the basal part .....4 *nausikaa*

3 Tegminal veins bright sanguineous .....1 *labena*

3a Tegminal veins pallid, sometimes faintly sanguineous....4
4 Tegmina yellowish brown; head and pronotum more or less orange brown .....2 *ogygia*
4a Tegmina pale testaceous, a pale fuscous band across the middle .....3 *kalypso*

Iassus detractus Walker, from Tasmania, is not included.

1. *labena.*

I have little doubt that the division of the discoidal, in the unique specimen, is an aberration. This single example is a male, not a female. The last segment is deeply, minutely, roundly emarginate and the plates (not 'valve') are elongate, and covered with long, curling, rather coarse, white hairs.

2. *kalypso* sp. nov.

Pale yellowish testaceous, a little paler beneath, vertex slightly embrowned. Tegmina hyaline with colourless veins (sometimes very narrowly margined with pale greyish fuscous), an irregular pale greyish fuscous band across the tegmen, sometimes other small suffusions. Tibiae apically and tarsi fuscous. Tergites more or less fuscous discally. Vertex much as in the type, perhaps a trifle wider; frons also in the type, but a little flatter, clypeus scarcely so broad apically.

Female: last segment roundly, a little angularly, produced, angularly emarginate narrowly, but sufficiently deeply, posteriorly; medianly carinate; the fuscous ovipositor is longer than the pygophor.

Length 6¼-6½ mill.

Hab. Viti Levu, Rewa (Apr., Muir).

3. *ogygia* sp. nov.

Form of the last; cheeks a little marginate interiorly. Yellowish brown, paler beneath, more or less suffused with rosy on head and pronotum. Tegmina yellowish brown, veins concolorous, or slightly tinged with sanguineous, apical cells apically (sometimes medianly but obscurely) fuscous. Apical half of hind tibiae dorsally fuscous. Tergites more or less fuscous discally.

Male plates elongate, with short pale yellowish grey bristly hairs.

Female genital segments much as in the last.

Length (male) ½ (female) 6 mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

4. *kassiphone* sp. nov.

Male: shining black; lateral margins of vertex, very narrowly (and ending at the apical margin of vertex), antennal peduncle, and labium, pale yellowish. Tegmina very dark fuscous, basally opaque black, shining. Fore and middle legs (except the somewhat fuscous coxae and claws) bright orange yellow; hind tibiae pale at extreme apex. Appendix to tegmina pale. Wings dark fuscous, veins black. Vertex distinctly narrower at the base than between the apical margins of the eyes, not flush with the eyes at the former, diverging regularly towards their apical margin, scarcely one third extended in front of the latter. Antennae inserted at about the middle of the interior margin of the eyes (ventrally), tempora short, very narrow. Plates much as in *T. labena*, but the hairs shorter and yellower.

Var. Clypeus, and apical margin, very narrowly, of genae, pale.

Female. Larger than the male; a longitudinal elongate-oval, pale yellow line on the vertex, not attaining (as a rule) the apical margin or the base; genae (except a trifle fuscous here and there sparsely) and clypeus pale yellow, as also sometimes the extreme base of the lorae. Tegmina with the subcostal vein right around to the apex of the tegmina, a long oval spot near the base of the subcostal cell and a long suboval stripe exteroapically on the same, a small spot near the apex of clypeus and another at the base of the tegminal appendix, pale yellowish brown. Fore and middle femora, tibiae and tarsi etc., bright orange-yellow, hind legs mostly blackish, at least dorsally. Genital segment as in *T. kalypso*, but scarcely emarginate medianly.

Var. Sides of pronotum pale yellowish, narrowly.

Length (male) 5 (female) 6 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Dec., Muir).

5. *nausikaa* sp. nov.

Similar to the last, but less polished, fore and middle legs *pale* yellowish, the yellow of the head and pronotum browner, the head longer, etc.

Male: black, with a strong, entire, wide, longitudinal pale yellowish-brown, continued to the posterior angle of the scutellum, the pale lateral margins of the head widening a little in front of the eyes and meeting in a curve at the base of the frons;

apical half of clypeus, the labium, fore and middle legs (except the more or less fuscous coxae and claws) pale; hind femora dark, tibiae more or less pale, at least ventrally. Tegmina dark fuscous, subcostal cells up to the oblique vein (except extreme base), a spot close to apex of subcostal cell, apical of the oblique vein, a spot at base of appendix, etc., pale. Vertex very little wider at anterior margin of eyes than at base, the latter practically flush with the eyes, lateral margins subparallel as far as anterior margins of eyes, then suddenly diverging. Vertex anteriorly roundly angulate, nearly as long in front of eyes as behind their anterior margin; frons rather narrower apically.

Vars. face entirely blackish or mostly pale; there are sometimes 3 pale lines on the pronotum. Tegminal veins varying from black to pale yellowish-brown, the latter sometimes a little tinged with sanguineous. Tegmina varyingly spotted with pale yellowish brown. Scutellum sometimes immaculate, sometimes posterior third pale.

Female larger than the male, and usually of the paler vars.

Extreme var. (male and female), *pallidor* nov. is pale cinereous above, with only scattered fuscous spots on the tegmina, four fuscous lines on the pronotum, etc.

Length (male) 4½-(female) 5½ mill.

Hab. Viti Levu, Rewa, (Feb., Apr., Nov., Muir), Navua, (Feb., Sept., Muir); Muir's No. 201 is an example of the less typical forms.

6. ————, sp?

Pl. II, fig. 14-15.

Only the nymph known so far.

Yellowish-white. Apical half of vertex; all the face except a median longitudinal stripe in the middle, reaching the clypeus but not the vertex; pronotum, tegminal pad, apical margin laterally of metanotum; two stripes down the abdomen, not quite reaching posterior margin, joined basally and apically, extending at these points to the lateral margins; apical half (except extreme) of femora, basal third (except extreme) of hind tibiae; sanguineous. Claws and arolia fuscous.

Hab. Viti Levu, Rewa (Apr., M.).

Muirella gen. nov.

Vertex flat, elongate, a little declivous, and somewhat sloping laterally, about twice and one half as long as wide at the truncate base, lateral margins parallel for about three-fourths of their length, then diverging outwardly to a little beyond the anterior margin of the eyes, then converging strongly, forming a roundedly acute angle. In profile the head is subconical. Ocelli lateral, a trifle nearer to the eyes than to the top of the head, visible dorsally. Frons elongate, about twice and a half as long as wide at antennal scrobes, a little wider just basal of this, narrowing apically and basally, basally acutely triangular, apically subtruncate. Tempora very short and narrow. Genae deeply impressed roundly in the middle. Clypeus not produced beyond the apical margin of the genae, about twice as long as wide, strongly carinate on the basal half, a little wider than the lora which do not touch the posterior margin of the genae. Labium reaching to anterior margin of fore trochanters. Antennae inserted anterior to the middle of the eyes (viewed in profile), the eyes extending posteriorly beyond the apical margin of the frons (thus separating this genus from the others) and decumbent nearly one-half, on the pronotum dorsally; seta long, more than half the length of the body. Pronotum transverse, lateral margins fairly long, somewhat feebly carinate; posterior margin obtuse-angularly emarginate. Scutellum wider than long. Tegmina with one subapical and 4 apical cells; the subcostal cell obliquely divided near the apex by a fork of the radial. Wing with a supernumerary cell, which however does not nearly reach the apical margin of the wing, the next of the apical cells being thus short and broad.

1. *oxyomma* sp. nov.

Pl. II, fig. 21-2.

Male. whitish testaceous (sometimes pale yellowish brown), usually more or less suffused rosily. Face usually with a transverse blackish band from eye to eye near the base (lora and clypeus, etc., often more or less fuscous). Prosterna, pleura partly, a spot on fore coxae, etc., blackish. Abdomen mostly blackish. Tegmina with the clavus, basal half of corium (except subcostal cell) and a bifid band near the apex dark fuscous or blackish (opaque basally), the rest yellowish brown. Veins bright sanguineous. Wings dark fuscous, iridescent, veins black. Hind

femora more or less blackish. Plates long, with long pale greyish hairs.

Female: abdomen yellowish testaceous, partly suffused with fuscous. Tegmina yellowish brown, an oblique dark fuscous band at base of apical third, a more obscure one basal of that; apical margin narrowly smoky, veins bright sanguineous. Hind femora pale. 7th sternite sinuate, minutely obtuse-angled in the middle.

Length (male) 6- (female) 6¼ mill.

Hab. Viti Levu, Rewa (Mar., the unique male, type, and females) and Navua (Feb.) (Muir's Nos. 116 and 203).

Nymph: pale whitish testaceous, fuscate on pronotum and scutellum, sparsely so on tergites; some sparse orange-red marks on the head. Vertex, pronotum and scutellum carinate, the first much of the appearance it has in the adult. Tergites with one submedian and one lateral row of piliferous, punctured granules. (Pl. I. figs. 10-12).

I have pleasure in dedicating this genus and species to my friend and colleague.

Tribe Penthimiini.

(=Gyponidae auctt.)

I can find no good characters to separate this tribe. It runs into the Tetigoniini via *Evacanthus*, into the Phrynomorphini via *Errhomenellus* and *Chiasmus;* its forms are usually less elongate, and the ocelli are usually on the disk of the vertex, but situated in front of a line drawn between the anterior margin of the eyes; this is however not the case in some species at present attributed to *Gypona*.

The following genera are I believe all that have been described:

1 The head dorsally with a large suboval area separated off anteriorly by a deeply impressed line..1 *Ectopiocephalus*

1a Head dorsally without a part separated off.....(2)

2 Tegmina very short, venation obscure.....(3)

2a Tegmina reaching at least as far as the base of the genital segment, fully formed .....(4)

3 Clypeus extending well beyond the apical margin of the genae, longer than half the length of the frons..... ..... 2 *Errhomenellus*

3a Clypeus extending only as far as the apical margin of the genae, not longer than half the frons .....3 *Chiasmus*

4 Pronotum prolonged posteriorly (more or less as in the Cercopidae) or at least distinctively longer than wide (5)
4a Pronotum wider than long.....(7)
5 Pronotum medianly truncate behind..... 4 *Signoretia*
5a Pronotum angularly emarginate behind.....(6)
6 Vertex gently rounded in front; frons subquadrate, truncate basally ..... 5 *Bathysmatophorus*
6a Vertex subangular in front; frons longoval, produced basally ..... 6 *Xerophloea*
7 Frons with a keel down the middle.....7 *Evacanthus*
7a Frons without a longitudinal keel.....(8)
8 Tegmen without an appendix .....(9)
8a Tegmen with an appendix .....(10)
9 Ocelli indistinct .....8 *Aglena*
9a Ocelli distinct .....9 *Uzelina*
10 Tegmina apically subsinuately truncate.....10 *Jafar*
10a Tegmina apically more or less rotundate.....(11)
11 Pronotum extending farther laterally than the tegmina, which arch outwards beyond the subaparllel basal fifth ..... 11 *Penthimia*
11a Pronotum not extending farther laterally than the tegmina, which arch outwards from the base, if at all.....(12)
12 Scutellum distinctly wider than the head..12 *Penthimidia*
12a Scutellum not wider than the head.....(13)
13 Anterior margin of vertex in profile acute or subacute; frons basally excavated .....(14)
13a Vertex not acute in profile, sometimes bluntly keeled; frons not excavated .....(15)
14 Head laminate; tegmina hyaline .....13 *Thaumatoscopus*
14a Head scarcely foliaceous; declivous; tegmina with numerous ramose "false" veins.....14 *Vulturnus*
15 Vertex declivous, sufficiently elongate.....15 *Gypona*
15a Vertex very short, forming one curve with the frons..(16)
16 Pronotum transversely striate.....16 *Scaris*
16a Pronotum not striate .....17 *Zinneca*

18. *Neodartus*, I do not know.

Vulturnus.

Differs from *Thaumatoscopus* principally as follows: vertex more declivous; clavus and the subcostal cells with numerous transverse veins and usually the entire tegmen with numerous

incomplete veins. There seem to be 8 good species in the Koebele-Perkins material, separable as follows:

1 Margin of head between vertex and frons, acute; anterior part of head laminate ..... (2)
1a Head anteriorly sublaminate, anterior margin thickened (4)
2 Length over 5¼ mill. ..... 3 *virgidemia*
2a Length under 5 mill. ..... (3)
3 Vertex a little longer than pronotum ..... 1 *vulturnus*
3a Vertex not longer than pronotum ..... 2 *voltumna*
4 Vertex ivory white, very sparingly speckled with palebrown ..... 4 *vanduzeei*
4a Vertex ivory white, with a basal fascia of pale-brown specks ..... (5)
4b Vertex dark, very closely speckled with pale yellowish.. (6)
5 Larger, broader ..... 5 *vaecors*
5a Smaller, more parallelsided ..... 6 *vultuosus*
6 Broader and paler ..... 8 *vappa*
6a Narrower and darker ..... 7 *vaedulcis*

Div. 1. Margin of head between vertex and frons acute, foliaceous.

1. *vulturnus*.

Head, pronotum and scutellum yellowish-brown, pronotum more or less infuscate. Eyes dark, ocelli reddish. Foliaceous part of frons and 2 spots on genae on each side, orange-red, rest of face and the prosternum black (or the frons may be entirely orange-red or entirely black except a narrow basal line). Underside testaceous. Tegmina sordid whitish, mottled with greenish brown or pale greenish or bluish-black, veins brownish yellow.

Vertex longer than pronotum, wider between the eyes than long, distinctly reflexed anteriorly, lateral margins of vertex in front of eyes short but very distinctly curved outwards before joining the arched anterior margin. Hind legs usually more or less dark.

Male: last segment truncate, a little shorter than the short pygophors.

Female: last segment slightly sinuate, a little produced medianly and laterally; pygophors about 2½ times as long as last segment, slightly shorter than ovipositor.

Length (male) 4-4¼ mill; (female) 4½-4¾ mill.

Hab. Queensland, Cairns (Aug., P.); Kuranda (Aug., P.).

2. *voltumna* sp. nov.

Closely allied to *V. vulturnus*, but vertex a little shorter, not longer than pronotum, strongly impressed transversely in the middle, basal part declivous, apical part slightly recurved, almost porrect instead of declivous as in *V. vulturnus*.

Vertex strongly, pronotum sparingly, mottled with blackish brown; scutellum marked with same colour. Tegmina heavily smudged with black. Underside black except the non-foliaceous part of frons and the basal margin (narrowly) of the foliaceous part, sordid orange. Anterior legs and bristles on the others, yellowish testaceous.

Female. Genital segment much as in *V. vulturnus*.

Length $4\frac{1}{3}$ mill.

Hab. Queensland, Kuranda, (Aug., P.).

3. *virgidemia* sp. nov.

Vertex, frons, clypeus, pronotum and scutellum castaneous, more or less clouded with blackish. Genae, lora, sterna, &c., more or less black. Tegmina yellowish testaceous, apically a little hyaline and more dilute, veins blackish brown, the colouring being more or less blotchy; the clavus subirrorate; the cells are mostly more or less marked with blackish-brown. Wings smoky, veins black. Fore legs pale, other legs more or less fulvous, longitudinally striped with black. Sternites yellowish brown, marked with darker brown.

Vertex about, or a little more than, twice as wide as long, rounded anteriorly parallel to posterior margin, extended laterally in front of the eyes about as far as posteriorly.

Female: last segment produced a little medianly, pygophors longer than ovipositor.

Length $5\frac{1}{3}$ mill.

Hab. Queensland, Kuranda (Aug., P.).

Div. 2. Margin of head blunt, subfoliaceous.

4. *vanduzeei* sp. nov.

Allied to *V. vulturnus*, but the margin of the head is not acute anteriorly, and the anterior margin immediately in front of the eyes is not (or not noticeably) divergent, before curving upwards and inwards.

Vertex, pronotum, and scutellum ivory white, more or less tinged with greenish, the vertex with a few scattered brownish

specks; pronotum obscurely mottled with greenish brown, sometimes with a whitening medio-transversely. Face black except for a few redbrown marks and the ivory-white basal margin. Sterna and pleura black (except for the more or less pale exterior half of propleura). Tegmina ivory white tinged with green, veins and in complete veins brownish. Fore legs pale, others mostly blackish; bristles pale. Sternites and genital segment pale or dark varyingly.

Male: pygophors a little more than twice as long as last segment which is bisinuate.

Length 4-4½ mill.

Hab. New South Wales, Sydney (Jan., K.).

The nymphs are not specially remarkable.

5. *vaecors* sp. nov.

Allied to the last, but the basal margin (except extreme part) with a transverse band of minute brownish reticulations. Pronotum mottled with palebrown, with a well defined undulating ivorywhite median fascia.

Male: genitalia much like those of the preceding species.

Length 4¼ mill.

Hab. Queensland, Bundaberg (Sept., Dec., K.).

6. *vultuosus*, sp. nov.

Very close to *V. vaecors*, but smaller, narrower and darker. Vertex a little shorter. Pronotum with a well marked white fascia and some black marks as well as the pale brown mottlings.

Female: last segment with 2 tiny median notches.

Length 3¾-4 mill.

Hab. Queensland, Cairns (Aug., P.); Nelson (July, P.); Kuranda (Aug., P.).

7. *vaedulcis* sp. nov.

Black; vertex, pronotum and scutellum thickly speckled with pale yellowish brown. Frons margined basally with yellowish. Tegmina pale yellowish brown heavily veined and marked with black; apex of costal cell and of the adjoining subapical white, spotshaped. Fore legs and bristles, &c., of the others, more

or less pale. Vertex not longer than pronotum, rounded in front.

Length 3-3¼ mill.

Hab. Queensland; Cairns (Aug., P.); Bundaberg (Sept.-Dec.); New South Wales, Sydney (Jan.-Feb., K.).

Nymph: Vertex laterally spinose just above the eyes.

8. *vappa* sp. nov.

Very close to *V. vacdulcis*, but paler and broader. Tegmina with a large colourless patch on the costa, &c.; apical parts largely colourless.

Length 4 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

Tribe Tetigoniini.

In the Tetigoniini, the male genital segments are of simple form. The last abdominal is probably the seventh. The pygophor is sometimes not visible ventrally, being covered over by the "Plates", which are not visible dorsally, except between and below the pygophor; apical of the 7th segment, there is dorsally a small semicircular plate, and ventrally a small triangular plate, which is called the "Valve"; both these may be altogether absent and their absence or presence is probably of generic value; for example, taking the careful figures in Ball's Monograph of the North American Tetigoniini, I find that the *valve* is present in *Dracculacephala* and *Helochara*, absent in *Diedrocephala*, *Tetigonia*, *Homalodisca*, *Aulacizes*, and *Oncometopia*. I am not sure that the *Plates* may not be absent sometimes.

In the females, the 7th segment is the last abdominal, the 8th is absent ventrally and only lateral margins can be seen, basally at the sides, the 9th is divided and is generally shorter than the ovipositor; the 7th is usually narrower than the preceding tergites and is very mobile, being lifted up from the apex, at right angles, so that the ovipositor can have free play.

Tetigonia.

There is no male valve in this genus (or if so, it is concealed).

1. *albida.*

Add Viti Levu, Rewa (Apr., Muir).

2. *koebelei.*

The 7th segment (female) triangularly (sides somewhat rounded) produced, the 8th segment attaining laterally about half the length of the pygophor, which has sparse dark hairs along by the ovipositor and at the apex, and very slightly exceeds the ovipositor in length.

5 and 9. *albomarginata.*

Tettigonia albomarginata Signoret 1853 A. S. E. France (3) I, 347, Pl. X, f. 4.

Tettigonia pettimolua Kirkaldy 1906 Bull. Ent. H. S. P. A., I, 321.

At the time of writing my description, Signoret's 'Revue' was unpurchasable, and I did not imagine that this species would be described as '*albomarginata*;' I have since been able to acquire, for the Station, Signoret's work and to identify Signoret's species. The colour of the tegmina, as indeed Signoret figures them, is dark metallic green, not plumbeous-black, as he writes. The species was found by Koebele on *Saccharum officinarum.*

7. *coerulescens.*

For Signoret's reference, read: *coerulescens* Sign., 1853 A. S. E. France, (3), I, 672, Pl. XXI, f. 16.

The vertex is subangulate, and the species is probably not a true *Tettigonia.* It is not coerulescent.

The genera of this tribe may be temporarily disposed as follows:

1 Juga porrect, straight or slightly deflexed at the apex, distinctly interrupting the lateral curve of the vertex; fore tibiae distinctly sulcate or flat, sometimes dilated.....(2)

1a Juga suddenly deflexed or noticeably curved from the base, never interrupting the lateral curve of the vertex; fore tibiae subcylindric (rarely otherwise).....(26)

2 Pronotum distinctly sexangular (or more), lateral angles distinct; tegmina completely covering the sides of the abdomen .....(3)

2a Pronotum transverse, quadrangular; rarely feebly hexangular (in which case the lateral angels are rotundate); tegmina often exposing the sides of the abdomen.....(8)

3 Pronotum normal; head not shorter than the pronotum.(4)

3a Pronotum crested or tuberculate or carinate. Head shorter than the pronotum.....(6)

4 Vertex sulcate longitudinally without an articulated appendix; fore tibiae a little dilated.....(5)

4a Vertex not sulcate, longitudinally, but with an articulated, elongate apical appendix; fore tibiae not dilated.....1 *Diestostemma*

5 Vertex prolonged filiformly; ocelli about as far from one another as from an eye; antennae short. Tegmina reticulate apically.....2 *Bascarrhinus*

5a Vertex not prolonged filiformly; ocelli about twice as far from another as from an eye; tegmina not reticulate.3 *Ciccus*

6 Pronotum crested.....4 *Zyzza*

6a Pronotum not crested .....(7)

7 Pronotum with 2, compressed, diverging horn-like appendages .....5 *Zyzzogeton*

7a Pronotum with 2 crescentiform tubercles.....6 *Leucopepla* (type *Tettigonia bituberculata* Sign.)

8 Vertex triangular, strongly narrowed, with a filiform, nonarticulated, apical process.....(9)

8a Vertex rounded apically (or if triangular, then not produced) .....(12)

8b Vertex triangular, with a subfoliaceous (or foliaceous?) process which curves back so as almost to touch the pronotum .....7 *Wolfella.**

9 Vertex not gradually passing into the apical process, which is much narrower than the apex of the vertex proper; fore tibiae dilated.....10 *Rhaphirhinus*

9a Vertex gradually merging into the apical process; fore tibiae scarcely, if at all, dilated.....(10)

10 Vertical prolongation widening a little apically, not sulcate, truncate; vertex indistinctly sulcate.....11 *Syringophora* (type *Tettigonia brevis* Walker).

10a Vertical prolongation narrowing to the apex, sulcate; vertex distinctly sulcate.....(11)

11 Pronotum posteriorly truncate.....12 *Acrobelus*

11a Pronotum posteriorly emarginate..... 13 *Catorthorrhinus*

12 Fore tibiae flat or sulcate.....(13)

13a Vertex longitudinally sulcate; pronotum nearly always distinctly narrowed in front; hind margin of propleura distinctly rounded or produced.....(18)

* 8 *Splonia* and 9 *Propetes* seem to be allied here, but I have not the description of the former and do not know either in nature.

14 Frons obtusely prominent, not longitudinally impressed; vertex not longer than its width between the eyes.....(15)

14a Frons nearly straight in profile; vertex longer than its width between the eyes.....(16)

15 Clavus with 2 veins (sometimes united in the middle for a short space).....14 *Oncometopia*

15a Clavus with one vein, which forks close to the apex and to the base.....15 *Dichrophleps*

16 Vertex not shorter than the pronotum; frons lightly convex, not gibbous; clavus with 2 veins uniting medianly.(17)

16a Vertex shorter than the pronotum; frons fairly convex or gibbous basally; claval veins distant.....16 *Cyrtodisca*

17 Vertex triangular, apex narrowly rounded, sensibly narrowed up to the apex in profile.....17 *Phera*

17a Vertex wider apically, semicircularly rounded there, sensibly narrowed in profile, with the apex obtuse.....
.....18 *Homalodisca*

18 Fore tibiae simple.....(19)

18a Fore tibiae dilated.....(22)

19 Clypeus strongly elevated, gibbous, angulate in profile.(20)

19a Clypeus convex, but not angulately gibbous, in profile....
.....19 *Aulacizes*

20 Pronotum and scutellum about equally long.....(21)

21a Pronotum narrowed anteriorly, scarcely impressed anteriorly .....22 *Amblydisca*

22 Tegmina apically rounded.....23 *Proconia*

22a Tegmina widely truncate apically.....(23)

23 Fore tibiae moderately dilated; ocelli strongly distant.....
.....24 *Acrocampsa*

23a Fore tibiae enormously roundly dilated; ocelli rather nearer to one another than to the eyes.....
.....25 *Cymbalopus* (type *Tettigonia bigibbosa* Sign.)

24 Vertex much longer than pronotum, depressed, not sulculate, lateral margins bidentate.....
.....26 *Ochrostacta* (type *diadema* Burm.)

24a Vertex not (or scarcely) longer than the not (or scarcely) transverse pronotum, lateral margins not dentate (juga slightly prominent near the eyes).....(25)

25 One vein in the clavus.....27 *Pherodes*

25a Two veins in the clavus.....28 *Acrogonia*

26 Tegmina hairy.....29 *Trichogonia*

26a Tegmina not hairy.....(27)

27 Tegmina apically reticulate; vertex mostly longer than the pronotum.....30 *Acopsis* (=*Dracculacephala.*)
27a Tegmina not, or only very slightly, reticulate. Vertex rarely as long as the pronotum.....(28)
28 Fore tibiae incrassate and compressed .....31 *Lissoscarta.**
28a Fore tibiae not incrassate or compressed.....(29)
29 Vertex obtusely rounded anteriorly, not sulcate, frons inflated; tegmina rounded apically, rarely slightly truncate. .....(30)
29a Vertex flat, sulcate, forming an acute angle with the lightly convex front; tegminally apically truncate or sinuate truncate ..... 33 *Diedrocephala*
30 Wings deeply fissured at the anal area which forms a dilated lobe. Vertex wider than pronotum.....34 *Dilobopterus*
30a Wings normal.....(31)
31 Second segment of antennae very long.....35 *Poochara*
31a Second segment of antennae short.....36 *Tetigonia.***

Tribe Megophthalmini.

The Megophthalmini contain apparently three genera, viz: *Megophthalmus*, *Paropulopa* and *Kahavalu*.

Membracidae.

Since the publication of my first Memoir, I have acquired a copy of Fairmaire's "Revue de la Tribu des Membracides" ***, which has thrown a little light on one or two points. There still remain, however, several species which I suppose belong to *Centrotypus*, but cannot determine satisfactorily at present.

Zanophara.

1. *leda* sp. nov.

=*Z. tasmaniae* (?) Kirkaldy (nec Fairm.).

Differs from *Z. tasmaniae* (Fairm., God.) as follows:

Head concolorous with pronotum, reddish-pitchy. Tegmina basally, subcostal cell, clavus, veins, &c., opaque reddish-pitchy, apically subhyaline, yellowish-ferruginous. Legs reddish-

* 32 *Sphaeropogonia* apparently is allied to this.

** With subgenera *Amblyscarta* (type *modesta* Fabr.) and *Poocloscarta*, (type *cardinalis* Fabr.) ;37 *Conogonia* and 38 *Sphinctogonia* are allied to *Tettigonia*. *Phereurhinus* I do not know.

*** 1846, A. S. E. France, (2) iv, 235-320 & 479-531, Pls. 3-7.

pitchy. Ocelli a trifle nearer to one another than to the eyes. Both angles of the apex of the pronotal horns acute, the exterior one more so, the horn distinctly longer and slenderer.

Female: abdomen beneath reddish-pitchy.

Length $8\frac{3}{4}$ mill.

Hab. New South Wales, Mittagong (Jan.) arboreal.

2. *albovittata* sp. nov.

=Z.*vitta* (?) Walker, Kirkaldy.

Differs from *vitta* (Walk., God.) as follows:

Median keel of pronotum pitchy basally. Tegmina basally, anal cell of clavus apically, subcostal cell, a stripe (entire, not bifurcate) along the middle of the corium, &c., smoky ferruginous, veins ferruginous. Ocelli practically equidistant from one another and eyes.

[Third apical cell with a transverse venule on one tegmen.]

Length 6 mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

Acanthuchus.

As Goding remarks, the differences between *Centrotypus* & *Sertorius* seem to be very feeble. In addition, I cannot draw any dividing line between these and *Acanthuchus.*

1. *iasis* sp. nov.

Differs from *Centrotypus occidentalis* and *minutus* by the small first "discoidal," and the upwardly elevated, not small, horns.

Reddish-pitchy, pronotal keel blacker on the disk. Tegmina ferruginous, basal veins reddish-pitchy, apically ferruginous. Tibiae, tarsi and apices of femora yellow-ferruginous. Ocelli a trifle nearer one another than to the eyes, yellow brown. Horns placed much as in *Zanophara leda,* but acute and turned outwards and upwards. Pronotal process reaches to apex of tegmina.

Length 5-$5\frac{3}{4}$ mill.

Hab. Queensland, Kuranda (Aug., type), Cairns (Aug.)

2. *curyone* sp. nov.

Allied to the last, but less elongate and more robust. Redder, the pronotal keel concolorous, process ferruginous. Ocelli dis-

tinctly nearer to the eyes than to one another, yellow brown. Tibiae and tarsi reddish pitchy. Tegmina vitreous, scarcely tinted, base and subcostal cell opaque, ferruginous; third apical cell elongate, narrow, interior side curving a little towards the exterior; first discoidal hemisphaerical, two-thirds the length of the first. Horns a little farther apart basally than in *A. iasis*, and a little shorter and blunter. The venation in some examples is irregular.

Length 5 mill.

Hab. New South Wales, Sydney (Feb.).

3. *eurynomus* sp. nov.

Fairly close to the last, but the horns are shorter and more depressed. Interior margin of third apical cell straight; first discoidal cell smaller, about half as long as the second. Legs less *yellowish*-ferruginous.

Length 5 mill.

Hab. Queensland, Bundaberg (Sept.-Dec.)

4. ? *bispinus* Stal.

In the absence of species for comparison, several forms are temporarily determined as above. It seems as much a *Centrotypus* as an *Acanthuchus*.

Hab. Queensland, Cairns (July-Aug.), Brisbane (Nov.)

CLASSIFICATION OF THE FULGOROIDEA.

Stal's classification of 1866, followed almost entirely by authors since that date, although separating the various groups fairly well, places the last *seven* in a parallel series, with more or less overlapping characters, an obviously unnatural arrangement. So many of the Fulgoroid genera are unknown to me in nature, however, that I am prevented from any thoroughgoing revision and can only offer some hints.

Hansen has laid great stress on the structure of the antennal sensory organs. My own researches confirm this, but at present I do not think it is practicable. Selected forms display the characters very sharply, but in a large number, it is impossible to see anything definite at a magnification of 188 diameters, and it is impracticable to focus a compound microscope nearer, without dissection, in the case of such minute antennae as those of

many Achilini, Ricaniinae, &c., and many forms are still known only as uniques.

I have therefore used the venation principally, especially the condition of the costal vein.

I have given little value to one of Stal's principal characters, viz: the running of the anal vein into the commissure or into the apex of the clavus, as all intermediate stages are present and it separates obvious allies.

The arrangement of sensory organs on the nymphs will probably be of great value, but from lack of certain definite material I cannot elaborate certain clues I seem to have found.

The following is an *attempt* at a more natural grouping:

Fam. 1. Poekillopteridae.

Costal vein fully developed, costal area nearly always with cross veins (*). Pronotum nearly always truncate behind. Subapical transverse line or lines on tegmina. (†)

Subfamily 1. Lophopinae.

Head narrower than pronotum; labium short, stout, the last segment short. (The antennal sensory organs appear to have an encircling of a few upright spines). Pronotum basally truncate. Costal vein fully developed, costal area with cross veins. No properly defined subapical transverse line or lines on the tegmen. Clavus not granulate. Hind tibiae spinose. First segment of hind tarsi short and stout.

Embraces 12 genera, the 7 established or confirmed by Stal, as well as *Astorga*, *Brixioides*, *Bisma*, *Jivatma* and *Pitambara*. Distant describes species in *Serida* and *Zamila*, appearing to have overlooked the fact that Stal has cited *Zamila* as a synonym of *Pyrilla*, and stated that *Serida* was not to be distinguished from *Lophops*. The structure of the head and the venation exclude *Kusuma*, *Varma* and *Padanda* placed here by Distant.

Subfam. 2. Tropiduchinae.

Clavus not granulate. Pronotum tricarinate, emarginate behind. Hind tibiae spinose, first segment of hind tarsi usually somewhat long.

* Except *Ossa*, *Tambinia*, and etc.

† Except the *Lophopinae*.

Tribe 1. Tambiniini.

Costal area very narrow, not veined transversely. *Isporisa, Colgorma, Ossa, Tambinia* and perhaps *Paricana,* &c.

Tribe 2. Tropiduchini.

Costal area broad, veined transversely. *Kusuma, Varma* and *Baruna* (the two first placed by Distant among the Lophopidae to which they have no resemblance, superficial or otherwise); *Conna, Elica, Rhotala, Daradax, Ficarasa* and *Epora; Stacota,* and *Tropiduchus, Eodryas* (*), *Peltodictya, Vanua, Rhinodictya* and *Peggioga,* and *Plegmatoptera,* (the latter placed by Stal in the Dictyophorini!).

Subfam. 3. Ricaniinae.

Clavus not granulate. Pronotum unicarinate, emarginate behind. Hind tibiae spinose, first segment of hind tarsi usually rather short.

Tribe 1. Bladinini (=Nogodini auctt.)

Frons not wider than long, lateral margins of clypeus keeled. This runs very close to certain Tropiduchini.

Tribe 2. Ricaniini.

Frons not longer than wide, lateral margins of clypeus keeled.

Subfam. 4. Poekillopterinae.

Clavus granulate; hind tibiae spinose. Cross veins in costal area, and unusually a transvere line on the apical part of the tegmen.

Tribe 1. Poekillopterini (=Flatinae).

Tribe 2. Phalaenomorphini (=Flatoidinae).

Family 2. Issidae.

Costal vein usually developed, tegmina often coriaceous and reduced; clavus not granulate. Sensory organs on antennae not surrounded by spines.

* New name for *Epora* Mel. 1903 nec Walker, 1857, which is allied to *Kusuma* (Distant.) Melichar has described and figured it; type *melichari*

Subfam. 1. Amphiscepinae.

Costal vein apparently not developed, tegmina Poekilloptera-niform, much reticulated as a rule. Hind tibiae not spinose. Frons not angulate laterally. There are only about 5 genera in this little group, *Amphiscepa* (=*Acanalonia*), *Chlorochara*, *Thiscia*, *Philatis* and *Parathiscia*.

Subfam. 2. Issinae.

Costal vein fully developed, or if not then the tegmen more or less coriaceous, with reduced venation. Hind tibiae spinose. Frons not angulate laterally.

This large group of nearly 80 genera runs very close to the Amphiscepinae on the one hand and to the Poekillopterinae on the other.

Subfam. 3. Eurybrachyinae.

Costal vein rarely not developed. Hind tibiae spinose. Frons angulate laterally (except *Gedrosia*). Tegmina usually coloured and opaque. Distant has placed an intrusive 'd' in this name: and places the group next to the Fulgorinae, probably because the tegmina are coloured.

Family 3. Tetigometridae.

This small family is usually placed among the Issinae. It differs from all the preceding by the segmented antennal bristle, the peculiar form of the antennal sensory organs and the general Tetigonioid appearance.

Brachyceps, Hilda, Egropa, Eurychila, Mitricephalus and *Tetigometra*.

Family 4. Fulgoridae.

Claval vein not granulate; costal vein not developed. Hind tibiae nearly always spinose, without a mobile spur. Sensory lobes present on antennae, bristle not segmented.

Subfam. 1. Cixiinae.

Anal vein of wing not reticulate.

Tribe 1. Cixiini.

Often 3 ocelli. Tegmina not reticulate apically, the anal vein runs into the commissure.

Tribe 2. Achilini.

Doubtfully distinct from Cixiini and only retained for convenience. Two ocelli always; the anal vein runs into the apex of the clavus. *Chroncba, Kirbyana* and *Mclandcva* placed in the 'Cixiinae' by Distant, do not agree with his characters, but belong here. *Kinnara* and *Paruzelia* perhaps belong here.

Tribe 3. Dictyophorini.

Not easily distinguished from the preceding by words, but of different habitus. Tegmina usually reticulate apically.

Augila (placed by Distant in the Issinae), *Lcusaba* and *Monopsis* (placed by Distant in the Tropiduchinae) belong here. In *Lcusaba*, the anal vein runs into the apex of the clavus.

Subfam. 2. Fulgorinae.

Anal area of wings reticulate. Tribes Fulgorini, Aphanini and Omalocephalini.

Fam. 5. Asiracidae.

Hind tibiae with a mobile spur; antennal sensory lobes absent, bristle segmented; costal vein not developed, clavus not granulate.

Fam. 6. Derbidae.

Clavus granulate (except in a few forms); anal area of wings (in most forms) with a stridulatory area. Hind tibiae without a mobile spur. Antennae often very remarkable, bristle not segmented. Costal vein not developed. Last segment of labium rarely otherwise than annuliform.

Vekunta, placed by Distant in the Achilinae, is a Derbid.

"*Hieracia*" *walkeri* Sign., is very evidently not a *Hieracia* at all. I am of the opinion that it forms a group near there somewhat intermediate between Issinae and Tropiduchinae, together with *Karna, Amfortas, Hieracia, Grynia*, as well as *Flavina* and *Nilalohita*, (the two latter placed by Distant in the Issinae) and perhaps *Padanda* (of Distant's Lophopidae!). Signoret's species forms the new genus *Dolia*, distinguished from *Hieracia* by the

greater number of tibial spines. It seems to be near *Flavina*, but the face is very different; it seems also near *Nilalohita*, but the clypeus is differently formed. Type *walkeri* Sign.

There seem to be therefore, in the Fulgoroidea, four principal types:

1. The Poekillopteroid, in which the costal vein is well developed. While such forms as *Lophops* and *Flata* seem little allied, yet the Ricaniinae form a link which it is hard to break.

2. The Issoid, in which the costal vein is usually developed. I think the Amphiscepinae (including *Acanalonia*, &c.) clearly belong here and not to the Poekillopteridae. *Tonga* is a remarkable form of uncertain affinities; I placed it at first among the Poekillopteridae. The Tetigometridae form a distinct family of apparently "degraded" Issidae.

3. The Fulgoridae have the costal vein obsolescent except basally. The Asiracidae are apparently developed from forms like *Oliarus*, but their many peculiarities render their separation necessary.

4. The Derbidae are probably polyphyletic, *Nisia*, *Lamenia* and some other forms approaching the Cixiini and Achilini.

The first and second groups apparently oviposit on the outer surface of leaves, while the third make an incision in the leaf or stem and place the eggs inside. Of the Derbidae, no eggs have, I believe, been found in nature.

Mr. Distant has recently criticized parts of my former memoir, relating to the Fulgoroidea, in the A. M. N. H. (7) XIX, 395-416 (1907)*. Those acquainted with Mr. Distant's works will, I am sure, wonder that Mr. Distant should complain of incomplete and rudimentary descriptions in other workers. I have considered his synonymical propositions in their several places. I may point out here however that Mr. Distant has so "carefully studied" my memoir, that he has misunderstood the scope of the entire work, the nature of which is plainly indicated even on the title page of the parts.

Poekillopteridae.

Lophopinae.

Astorga.

Stal (1866 Hem. Afr. IV) places the "Lophopida" among those groups in which the anal vein runs into the apex of the clavus

* See my reply op. cit., later.

or into the sutura clavi. Melichar (1903 Hom. Ceylon) incorrectly characterizes it as "Head and eyes together as wide as the pronotum" (added to Stal's character of the anal vein running into the claval suture), although he includes therein *Elasmoscelis radians* and *platypoda* in which the head is much narrower than the pronotum. *Astorga* bears a very close general resemblance to *Lophops,* but the anal vein clearly runs into the commissure: however, it is best located in the Lophopinae at present. It may be distinguished from *Lophops* by the form of the tegmen.

1. *saccharicida.*

On Pl. XXVIII, f. 11, of my former contribution, an ocellus should have been depicted between the apex of the antennae and the anterior margin of the eye, a little inwards; a nymph of this species is figured on Pl. I, figs. 8-9.

I do not regard *Kusuma, Varma* and *Padanda* of Distant as Lophopid.

Tropiduchinae.

The following are now figured:

Rhinodictya quaesitrix, Pl. IX, figs. 12-13.

Peltodictya kurandae Pl. VIII, figs. 3-4.

Distant (1907 A. M. N. H. (7) XIX, 416) cites *Peltodictya* as synonymous with *Ficarasa* Walker. In the latter, however, the apical cells of the tegmina are reticulate, while there are no cross veinlets at all in *Peltodictya* from the apical margin right up to the subapical line.

It may be useful to point out that Mr. Distant's correction of the misprint in the reference to the figures of *Vanua viticnsis* is itself incorrect. As mentioned in the 'Errata' at the commencement of the volume, *Vanua viticnsis* adult is figured Pl. XXVIII, figs. 7-9 and the nymph on Pl. XXVII, figs. 6-7.

The following have been described as Tropiduchinae:

Ficarasa australasiae Distant 1907, op. c., 287, Queensland (very probably belongs to my genus *Peltodictya*).

Magia subocellata Distant, op. c., 288, do.

I regard the following genera as Tropiduchinae:

Plegmatoptera, placed in the Dictyphorinae by Stal,

Kusuma and *Varma,* placed by Distant in the Lophopinae. I do not regard the following genera as belonging to this sub-

family, viz: *Leusaba, Hiracia, Karna* and *Paruzelia.* I also follow Ashmead and Swezey in placing *Monopsis* Spinola (=*Nonopsis* Distant) among the Dictyphorinae; it certainly is not Tropiduchine as Distant pretends. (See A. M. N. H. (7) XVIII, 356).

Ricaniinae.

Euricania.

tristicula.

Hab. Viti Levu, (Mar., K.), Rewa (Dec., Apr., M.).

Plestia.

1. *marginata.*

Plestia do. (Montr.) Melichar 1898 Ann. Mus. Wien. XIII, 294, Pl. XII, f. 17; Pl. XIV, f. 1.

Hab. Viti Levu, Rewa (Feb.-Apr., M.).

The parts described in previous descriptions as yellow, are pale opaque green, in fresh examples.

Gaetulia.

Distant (p. 394) states that the head is considerably narrower than the pronotum. This is incorrect as a generic character, for in *G. chrysopoides,* the eyes project very slightly beyond the pronotum; Distant's figure (203) also scarcely bears out his diagnosis, moreover the clypeus is *not* carinate, as indeed Stal also states.

Poekillopterinae.

Siphanta.

The Australian species may be disposed as follows:

1. Vertex distinctly longer than wide.....1 *galeata*
1a. Vertex not longer than wide.....2
2. Vertex scarcely (if at all) wider than long; species 8 mm. long (or more).....3
2a. Vertex nearly (or quite) twice as wide as long; [tegmen with dark scattered granules]; species not more than 8 mm. long. 7
3. Reddish (or blackish) granules on tegmen, especially on clavus. 4

3a. No reddish (or blackish) granules on tegmen (*).....6
4. Vertex angulate, sutural angle of tegmen rounded.....5
4a. Vertex rounded, sutural angle acute.....2 *acutipennis*
5. Vertex longer than pronotum, frons scarcely longer than wide (typically with a yellow stripe on tegmen).....3 *toga*
5a. Vertex and pronotum equally long, frons twice as long as wide. .....3a *patruelis*
6. Anterior margin of pronotum entire (truncate or rounded) ..... 4 *acuta*
6a. Anterior margin of pronotum notched minutely in the middle ..... 5 *breviceps*
7. Species under 6 mm. long .....6 *granulicollis*
7a. Species 6 mm. or over 8
8. Colour of tegmina pinkish testaceous.....8 *granulata*
8a. Colour of tegmina orange yellowish.....7 *lucindae*
8b. Colour of tegmina greenish or yellowish green.....9
9. Granules on corium few, small and inconspicuous; pronotum without a red line; disk of scutellum with one green line .....9 *subgranulosa*
9a. Granules large and conspicuous, pronotum with a red longitudinal line, disk of scutellum with three green lines.... ..... 10 *sensilis*

N. B. *rubra* Schmidt remains unrecognizable to me.

1. *galeata.*

Pl. V, fig. 3 & Pl. VI, figs. 3-4.

2. *acutipennis.*

Pl. III, fig. 1 & Pl. VI, figs. 1-2.

The reddish and blackish granules on the tegmen, as well as some usually conspicuous crimson spots, distinguish this at once from *S. acuta.*

3. *toga*

Pl. III, fig. 3 & Pl. VII, fig. 11.

The Bundaberg record should be deleted, and on p. 455 line 3, for "tatter" read "latter."

* This does not refer to the exceedingly minute greenish, yellowish or brownish granules numerous in each (or most) of the reticulations on the tegmen.

4. *acuta.*

Pl. III, figs. 2 & 4: Pl. VI, figs. 13-14.

This species is also a little variable as regards the apical margin of the tegmen. In some examples it is slightly but distinctly concavely emarginate, in others slightly convex, and it varies a little as regards the prominence of the sutural angle. The ova in situ and the last nymphal instar are figured on Pl. VI, figs. 17-20.

5. *breviceps.*

Pl. III, fig. 2.

Allied to *acuta,* not to *acutipennis.*

6. *granulicollis.*

Pl. IV, fig. 2 & Pl. VI, figs. 7-8.

The vertex, in what I suppose to be this species, is usually obtuse-angled, but varies from that to being distinctly rounded. The scutellum is shorter than in the other species, the disk is typically brownish-red with one longitudinal green stripe.

Length: 5 to 5⅞ mill.

Hab. New South Wales, Sydney (Jan.-Feb.) Mittagong (Jan.)

The *S. minuta* of Melichar is perhaps a variety of this, introduced into Saint Helena. In all the species of *Siphanta* I have seen, the apical margin of the tegmen is always spotted with crimson, though sometimes extremely faintly, as probably is the case with *S. minuta.*

7. *lucindae.*

Pl. IV, fig. 3 & Pl. VI, figs. 5-6.

8. *granulata.*

Pl. IV, fig. 4.

Very close to the last, but yellower, and more granulate on the corium.

9. *subgranulosa.*

(=*granulicollis* Kirkaldy olim, nec Stal)

Pl. V, fig. 1 & Pl. VI, f. 12.

Hab. Queensland, Cairns (July-Aug., P.), Bundaberg (June P.). This possibly =*S. rubra* Schmidt.

10. *sensilis,* sp. nov.

Pl. IV, fig. 1, & Pl. VI, figs. 15-16.

Allied to *granulicollis,* but larger, the corium with more granules which are also larger individually. Pronotum green with one red stripe. Disk of scutellum brownishred with three green stripes.

Length 6 to 6½ mill.

Hab. Queensland, Cairns (July-Aug.).

Thanatochlamys gen. nov.

Allied to *Siphanta,* but the vertex is short, narrow, flattish but a little swollen along the middle, very slightly ascendant, not granulate. Frons elongate, with 5 strong keels. Clypeus not, or obtusely, keeled at the side. Pronotum granulate, strongly keeled medianly. Scutellum shining, not granulate, flattish though a little inclined to be swollen anteriorly. Venation different, angles of tegmina not prominent. Tibiae with one spine.

1. *tristis* sp. nov.

Pl. V, fig. 4 & Pl. VI, figs. 9-10.

Vertex and pronotum olivaceous with paler keels and granules. Frons and scutellum fuscous with paler keels. Clypeus, legs, abdomen beneath, etc., fuscotestaceous. Clavus olivaceous with blackish granules, corium dark fuscous with paler veins and blackish granules basal two thirds of exterior margin paler.

Length 7¾ mill.

Hab. Queensland, Cairns (July).

Phantiopsis.

Phantiopsis Melichar 1905 Ann. Mus. Hung. III, 474.
=*Aphanophantia* Kirkaldy 1906, op. c., 458.

1. *australiaca.*

Pl. VII, figs. 4-6.

Phantiopsis australiaca Mel., l. c., 475.
=*Aphanophantia cuscuticida* Kirk., l. c., 459.

Issidae.

This family contains three subfamilies:

1 Face not laterally angulate.....(2)
1a Face laterally angulate..... 3 Eurybrachyinae
2 Hind tibiae with a spine or spines.....1 Issinae
2a Hind tibiae spineless in adults (but spinose in nymphs).... ..... 2 Amphiscepinae

Issinae.

The following table is amended from the first memoir:

1 Tegmina reaching at least to apex of abdomen, clavus sutured off from corium .....(2)
1a Tegmina in the form of narrow, elongate straps, reaching far beyond the apex of the abdomen; wings rudimentary; hind tibiae with two spines.....10 *Alleloplasis*
1b Tegmina abbreviated, clavus not sutured off from corium; wings rudimentary; hind tibiae with one spine..... ..... 9 *Gelastissus*
2 Wings reaching at least to apex of abdomen.....(3)
2a Wings absent or rudimentary.....(6)
3 Appearance Cercopoid; wings deeply incised apically...(4)
3a Appearance Poekillopteroid; wings not incised apically.... ..... 4 *Tylana*
4 Frons longitudinally carinate, sometimes feebly; inner fork of radial vein practically forming a straight line with the basal stalk of the vein .....(5)
4a Frons polished, not carinate; inner fork of radial forming an obtuse angle inwardly, with the basal stalk of the vein.... ..... 3 *Phacopteryx*
5 Tegmina less than 2½ times as long as broad, inner fork of radial vein not reforking till just basal of the apical margin ..... 1 *Chlamydopteryx*
5a Tegmina over 3 times as long as broad, inner fork of radial reforking well basal of the apex of the clavus..... ..... 2 *Apsadaropteryx*
6 Hnd tibiae with 1 spine .....5 *Lipocallia*
6a Hind tibiae with 2 spines.....(7)
7 Hind margin of pronotum straight.....(8)
7a Hind margin of pronotum widely emarginate.....6 *Bilbilis*
8 Frons basally truncate, with a keel along the middle..... ..... 7 *Hysteropterum*

8a Frons medianly emarginate at base, with a median and a circular keel ..... 8 *Orinda*

Chlamydopteryx gen nov.

Allied to *Sarima* Mel., but the venation is different. Head and pronotum not at all flush. Circular keel of frons continuous and the apico-lateral part of frons a little lobate. Frons granulate around the keel. Fore tibiae somewhat widened. Type *vulturnus*.

1. *vulturnus*.

Pl. VII, figs. 15-16.

Issus vulturnus Kirkaldy.

2. *ridicularius*.

Pl. VII, figs. 12-14.

Issus ridicularius Kirkaldy.

In both these species, part of the frons is visible dorsally, the base of the rounded basal carina being visible above as a straight keel; vertex almost truncate basally. The outer branch of the radial vein is strongly arched basally. In *C. ridicularius*, the clypeus is striate, a character however probably not very important.

5. *eurobium* sp. nov.

Allied to the last, but the colour is browner. Vertex more transverse, the apical margin almost truncate, frontal keels very feeble. Outer branch of radial angularly bent near the base, as seen from above.

Male: pygophor as in *C. ridicularius*.

Length 5 mill.

Hab. Queensland, Cairns (August).

Apsadaropteryx gen. nov.

Allied to *Sarima*, but the subcircular keel of the frons is continuous except at the apical margin and the clypeus is slightly striate; the veins of the tegmen are strongly marked and the inner fork of the radial vein reforks well basal of the apex of the clavus. Fore legs not widened.

1. *elongatulus.*

Pl. VII, figs. 9-10.

Issus elongatulus Kirkaldy, l. c.

Phaeopteryx gen. nov.

Differs from the above by the exterior branch of the radial vein being almost rectangularly bent near its base; the subcostal cell apical of this bending is very narrow, with numerous transverse veins. Frons broader than long, convex medianly, no keels except the transverse basal one, but the lateral margins are flat, posterior margin emarginate. Base and lateral margins of frons, the pronotum, &c., strongly granulate.

1. *sidnicus.*

Pl. VII, figs. 20-1.

The nymph of this is figured (figs. 17-19).

Orinda gen. nov.

Allied to *Hysteropterum,* but the frons basally is emarginate with acute lateral angles, and the venation is quite different. Vertex transverse, truncate apically and basally. Costal margin roundly dilated at the base, then subconstricted. Wings rudimentary.

1. *lucindae.*

Sarnus lucindae Kirkaldy, op. c., 440.

Tylana.

Tylana (Stal) Melichar 1906 Abh. Zool. bot. Ges. Wien III (pt. 4) p. 198.

1. *acutipennis.*

Pl. VII, figs. 1-3.

Lollius acutipennis Kirk.

This is not *Tylana acutipennis* Mel., which is differently coloured and has the submedian frontal keels uniting with the median

well apical of the base of the frons (and not almost at the base) and more arched laterally. (*)

2. *angustifrons.*

Lollius angustifrons Kirkaldy.
Tylana conspurcata Melichar, l. c., 203.

Of unrecorded Australian forms, I now add *Bilbilis modestum* Stal, from "North Australia" and New South Wales.

Mr. Muir did not collect any Issinae in Fiji, but the following are noted by Melichar:

Tylana intrusa Melichar, and *T. orientalis* Mel., from Ovalau, and *T. piceus* (Walker) from Viti Levu, the last named also from Aru and Papua. The Genus *Tylana* has an interesting distribution viz.: North America (1 sp.), Borneo (1 sp.), Celebes (2 sp.), Papua and neighboring isles (6 sp.), New Caledonia and Lifu (3 sp.), Australia (2 sp.), Fiji (3 sp.), Samoa (1 sp.), and the Mascarene Isles (2 sp.).

In Bulletin IV of this division (1907), I described one new Issine from North America, and doubtedly identified another. I have been able since to confirm these by Melichar's Monograph, *Bruchomorpha mormo* being allied to *B. pallidipes* Stal, but quite unicolorous, except part of the legs, as described. *Picumna ovatipennis* may be confirmed.

Eurybrachyinae.

I must leave my former notes in the same unsatisfactory state, as I still do not know what Stal meant to define precisely by his genus *Platybrachys.*

Recently (1906 A. M. N. H. (7) XVIII) Distant has described one genus and 3 species from Queensland, as new. *Yarrana* 206, seems to differ from *Dardus* Stal, only by the much longer tegmina.

1 *sinuata* 207; Queensland, Townsville, Karanda (sic!) and Cairns.

2 *continuata* 207; Queensland, Townsville.

Olonia Stal.

6 *marginata* 206; Queensland.

Distant (1907 op. c., XIX, 415) very confidently synonymizes *Dardus immaculatus* Kirkaldy with *D. obscurus* Distant. The

* For *Tylana acutipennis* Mel., which is a Bornean species, I propose the name *T. dyakana.*

latter however has the face and legs pale sanguineous, while in the former the face is uniformly dark brown (except for some pale and clypeal specks), and the hind femora only are sanguineous, the rest of the legs being piceous except as indicated in my description.

Fulgoridae.

Cixiinae.

Distant, following Melichar, places *Kirbyana* in the "Cixiinae," despite the fact that the anal vein reaches the apex of the clavus, that there are only two ocelli and that the clypeus is laterally carinate, a combination of characters which according to Distant himself, would place the genus in the "Achilinae." He also places the genus *Kinnara* in the "Achilinae," but there are three ocelli here and the anal vein scarcely reaches the apex of the clavus; it therefore belongs to the "Cixiinae."

Tribe Cixiini.

The Australo-Fijian genera fall into groups as follows:

1 Antennae elongate, distinctly visible beyond the lateral margins of the head ..... 4 *Solonaima*
1a Antennae minute ..... (2)
2 Scutellum with 5 keels ..... (3)
2a Scutellum with 3 keels ..... (4)
3 Vertex extending but little beyond the eyes, face not foliaceous ..... 1 *Oliarus*
3a Vertex extending well beyond the eyes, face subfoliaceous laterally ..... 2 *Urvillea*
4 Frons with 3 distinct ocelli ..... (5)
4a Frons with 2 ocelli ..... (6)
5 Tegmina widely rounded towards the apex ..... 6 *Leiriocessa*
5a Tegmina long and narrow ..... 5 *Myndus*
6 Head produced in front of eyes, vertex elongate..... (7)
6a Head scarcely produced, vertex not elongate..... (10)
7 Tegmina of usual *Cixius*-form..... (8)
7a Tegmina (as seen dorsally) strongly compressed .... (9)
8 Tegmina not granulate..... 3 *Nesocharis*
8a Tegmina strongly granulate ..... 7 *Carolus*

9 Genae very clearly separated posteriorly, lateral margin of frons remote from eyes, ocelli and antennae..... ..... 8 *Gelastocephalus*

9a Genae much narrowed posteriorly, lateral margin of frons close to eyes, ocelli and antennae .....9 *Nesochlamys*

10 Head dorsally doubly carinate transversely..10 *Leptochlamys*

10a Head not carinate transversely below the front margin..(11)

11 Tegmina of usual *Cixius*-form.....11 *Calamister*

11a Tegmina strongly compressed (as seen dorsally).....(12)

12 Base of vertex slightly emarginate.....12 *Australoma*

12a Base of vertex truncate .....(13)

13 Pronotal emargination anteriorly nearly touching base of vertex ..... 13 *Dystheatias*

13a Pronotal emargination not nearly touching base of vertex.. ..... 14 *Quirosia*

Oliarus.

Four species are now added, 3 from Fiji, and 1 from Queensland. I regret that I have not had time to study the genitalia of the species, as these present good characters. The following table comprehends the 12 Australo-Fijian species now known.

1 Apices of the first and second segments of the hind tibiae each with about twenty small spines which do not (or at least only one or two of them) extend beyond the apical margin of the segment (subgenus *Nesopompe* nov.)..(2)

1a Apices of these segments with from 5 to 8 (according to the species) larger spines which mostly extend well beyond the apical margin of the segment (*Oliarus* sens. str.)..(3)

2 Tegmina hyaline (type of subgenus).....11 *felis*

2a Tegmina hyaline, the apical fourth smoky....12 *saccharicola*

3 Axillary vein of tegmen running into anal vein, basal of the middle of the latter .....(4)

3a Axillary running into anal at, or apical of, the middle of the latter ..... (8)

4 Axillary very short, not quite half (taken from its curving or angulation at the commissure) the length of the stalk of the anal .....1 *laertes*

4a Axillary long, more than half the length of the stalk of the anal ..... (5)

5 Tegminal veins more or less thickly granulate .....(6)

5a Tegminal veins not, or obsolescently, granulate..2 *kampaspe*

6 Veins basal of the membrane dark.....3 *asaica*
6a Veins basal of the membrane pale, with dark granules..(7)
7 Head and scutellum pale .....4 *talunia*
7a Head and scutellum black and castaneous.....5 *lilinoe*
8 Vertex much narrower at the base than an eye.....(9)
8a Vertex scarcely, or not, narrower at the base than an eye .....(10)
9 Lateral margins of vertex forked at the anterior margin of the eyes, so that the anterolateral margins of vertex do not reach the apical margin and are connected therewith by 2 very short, parallel, keels .....6 *tasmani*
9a Lateral margins of vertex forked well below the anterior margins of the eyes, the inner margins meeting acutely below the anterior margin of the head dorsally and continuing thereto .....7 *alexanor*
10 Tegminal veins granulate .....9 *sponsa*
10a Tegminal veins not granulate 11
11 Tegminal cross veins thickened, but not widely suffused.. .....9 *lubra*
11a Tegminal cross veins strongly and widely suffused..... .....10 *phelia* *

5. *lilinoe* sp. nov.

Like a large, dark *talunia,* but the venation is different. Differs from *O. laertes* by the veins of the tegmen basal of the membrane being pale (with dark granules), not dark, consequently the dark hue of the suffused cross veins shows up more prominently; also by the greater length of the axillary vein. It is allied to *O. asaica,* but is much smaller, the tegmina are paler and the vertex is much narrower. Frons and clypeus dark fuscous, median keel and lateral margins pale ochraceous. Scutellum dark fuscous; the median keel, the lateral keels and the space between them, and the extreme lateral margins ferruginous.

Length 5¾ mill.

Hab. Queensland, Cairns (July, P.).

6. *tasmani* sp. nov.

Allied to *O. alexanor,* but the head form is different and the tegminal granules feebler. Blackish, keels dark ferruginous,

* Distant has recently described two species, *O. dinghana* and *O. lubra* from Queensland (1907 A. M. N. H. (7) XIX, 282), but it is not possible to identify them from the descriptions. N. B. Since the above was in proof, Distant has renamed his ‖*lubra*, "*incerta*," an excellent name judging by his description.

frons ferruginous, sometimes suffused with fuscous. Pronotum pale, lateral margins fuscous. Tegmina hyaline, veins mostly pale with fairly closely set but not prominent fuscous granules. Subcostal vein yellowish fuscous; stigma dark fuscous; apical veins and subapical transverse veins suffusedly dark fuscous. Wings hyaline, veins dark fuscous. Legs bright yellow, obscurely annulated with fuscous. Vertex as in *O. alexanor*, but the lateral margins are forked at the anterior margin of the eyes, so that the anterolateral margins of vertex do not reach the apical margin and are connected therewith by 2 very short parallel keels. Labium reaches the hind coxae. There are 6 spines each on the apex of the 1st and 2nd segments of the hind tarsi.

Male: sterna and abdomen more or less piceous, hooks, &c., pale.

Length (male) 5½ (female) 6⅛ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

The scutellum is sometimes ferruginous between the keels.

The species is named after Tasman, who discovered the Fijian archipelago.

9. *lubra*.

Pl. VIII, figs. 7-9.

A rather smaller race, the males measuring as little as 6 mill., has been found in Viti Levu by Muir (No. 7) in Ba (Jan.), Rewa (Mar.-May) and Navua (Feb.) on Breadfruit, (*Artocarpus incisa*); they may be termed var. *vitiensis*.

10. *phelia*.

Pl. VIII, figs. 10-12.

11. *felis*.

Pl. VIII, figs. 5-6.

12. *saccharicola* sp. nov.

Allied to *O. felis* but distinguished by the smoky apical fourth of the tegmina.

Blackish; keels of vertex, lateral keels of frons and clypeus, legs, &c., pallid; hind femora more or less fuscous; keels of scutellum (usually) and median keel of frons ferruginous. Pro-

notum pale, latral margins fuscous. Tegmina milky hyaline, apical fourth smoky, veins of basal two-thirds pale, not granulate, veins of apical third darker, with dark fuscous granules. Wings smoky hyaline, veins fuscous. Abdomen more or less blackish.

Length (male) 4½ mill.

Hab. Viti Levu (Muir No. 81), Rewa (Dec., M.), *on Saccharum officinarum.*

Urvillea gen. nov.

The characters of *Oliarus,* but the vertex extends well beyond the eyes; frons and clypeus apparently fused but there is an ocellus in the middle of the facial keel; the face is ampliate and foliaceous in the middle laterally. Tegmina not granulate. Superficially like *Occleus* but the posterior femora are spined, and the venation is Oliarine. This genus the type of which is *U. melanesica,* is named after the celebrated traveller Dumont d'Urville, who made the first chart of the Fijian group.

1. *melanesica*, sp. nov.

Black; head keels (blackened at anterior margin), the foliaceous part of the face, labium (except the blackish fourth segment), legs (except the tarsi which are partly dark), tegulae, &c., yellow or brownish-yellow, lateral margins fuscous. Scutellar keels dark ferruginous. Tegmina hyaline, veins on basal two-thirds brownish-yellow, subcostal and those on apical third dark fuscous; cross veins a little suffused, apical margin narrowly smoky, stigma dark fucous. Vertex parallelsided, nearly four times as long as the basal width extending in profile nearly one-half the length of an eye in front of the latter. First segment of hind tarsi with 6 teeth apically, second with 5. Labium reaching to hind trochanters.

Length (male) 7- (female) 8 mill.

Hab. Viti Levu, Rewa (Mar.- Nov., M.).

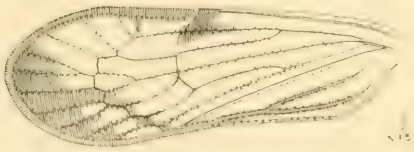
Nesocharis, gen. nov.

Apparently not very closely related to any known Cixiine. It differs from *Cixius* by the venation and the simple legs. From *Occleus* it differs by the basal cell emitting 3 veins.

Vertex excavated, posterior margin acute angularly emarginate. Face elongate diamond-shaped (flat), more than twice as long as wide, widest about the antennae, subconstricted at the

frontoclypeal suture which is a little obsolescent; no vertical fossettes. Pronotum acute-angularly emarginate posteriorly. Scutellum with three straight keels. Subcostal margin of tegmina sinuate near the base and also a little apical of the middle. Internal cell of clavus granulate.

1. *kalypso*, sp. nov.



(Text figure 1).

Black; head keels (anteriorly blackened), face, antennae, pronotum, sterna and legs whitish. Tegmina hyaline tinged with yellowish, subcostal vein near the base and from the stigma apically, radial vein and its forkings, stigma, apex anteroobliquely, claval vein apically &c., smoky often a little suffusedly. Vertex extending a little in front of eyes, lateral keels somewhat convergent anteriorly, forking about the apical margin of the eyes. Labium reaching nearly to apex of hind femora.

Length (female) 4½ mill.

Hab. Viti Levu, Rewa (Mar. M.).

Solonaima solonaima.

Pl. VIII, fs. 13-15.

Myndus.

Myndus Stal. 1862, Berlin Ent. Zeit. VI.

A North American genus, the Japanese species described by Uhler being, according to Matsumura, an *Oliarus*. The species now described is possibly not a true *Myndus*, but agrees in all apparent essentials.

1. *vitiensis* sp. nov.

Blackish; vertex soiled brownish-yellow, pronotum whitish; keels and lateral margins of scutellum sordid ferruginous. Tegmina sordid hyaline, basal veins pale, subcostal vein and apical third with veins dark fuscous suffusedly, and with 2 curved dark

fuscous streaks. Sterna and legs sordid brownish yellow. Abdomen blackish brown. Vertex with lateral margins slightly converging apically, extending a little in front of the eyes. Frons as broad as long, lateral margins strongly reflexed.

Length (female) $3\frac{7}{8}$ mill.

Hab. Viti Levu, Navua (Feb., M.).

Lciriocssa gen. nov.

Apparently allied to *Brixia,* but the vertex is broader than an eye and well produced anteriorly. Antennae not exserted, second segment globular. Pronotum of very different structure. Tegmina apically rounded, distinctly widening towards the apex. Hind tibiae with 3 larger and sometimes one or two smaller spines. Type *tortricomorpha.*

1. *tortricomorpha* sp. nov.

Pl. XXVII, figs. 9-21.

Fusco-testaceous, irregularly suffused with fuscous. Disk of scutellum tinged with ferruginous, a pale line down the middle, darker fuscous outside the lateral keels. Ocelli ruby-red. Tegmina subhyaline, veins pale with dark granules and an ashy fuscous band, etc., as in the figure.

Length of body, $4\frac{1}{2}$ mill; expanse of tegmina nearly 11 mill.

Hab. Queensland, Cairns (Aug.), Kuranda (Aug.)

2. *viticnsis* sp. nov.

Differs from the above by the more elongate and differently patterned tegmina.

Head, pronotum and scutellum sordid piceofuscous, underside and antennae pale, 3rd ocellus rubid. Fore and middle femora fuscopiceous (except the extreme apex and base), tibiae of the same suffused with fuscopiceous. Tegmina hyaline tinged with cinereous, veins cinereous whitish, basal half with blackish-brown granules, apical half not granulate (except a few inwardly); two or three blackish-brown markings near the base and a transverse band across the corium a little basal of the middle. Wings milky hyaline, veins pallid. Labium reaches well beyond hind coxae.

Length $5\frac{3}{4}$ mill.

Hab. Viti Levu, (Mar., Muir's No. 142), on a native tree in the bush.

Leptochlamys gen. nov.

Somewhat allied to *Calamister*, but the head is different and the tegmina are strongly compressed.

Vertex transverse, scarcely extending so far as the anterior margin of the eyes, part of the frons visible dorsally. Head laterally strongly carinate (a little foliaceously on the frons), frons and clypeus strongly keeled medianly, vertex strongly keeled anteriorly transversely, and there is a transverse keel between this and the base but no longitudinal keel. Antennae very short. Ocelli present. Pronotum deeply emarginate posteriorly. Scutellum with 3 keels.

compressa sp. nov.

Pl. VIII, figs. 1-2.

Brownish testaceous, a little browner on the scutellum. Beneath testaceous. Tegmina subhyaline testaceous, veins mostly concolorous (except the darker marginal), feebly granulate, apex of subcostal cell and adjacent apical cells, interoapical (rounded) angle, etc., smoky.

Length 4⅝-5 mill.

Hab. Queensland, Cairns (July), Kuranda (Aug.)

Dysthcatias gen. nov.

Allied to *Leptochlamys* but the vertex is only slightly transverse and extends beyond the eyes anteriorly; there is only one cross keel between vertex and frons. Vertex truncate behind, the pronotum almost rectangularly emarginate, nearly touching base of vertex. Frons apically angularly emarginate, 3rd ocellus absent. Tegminal veins strongly granulate, the granules piliferous.

1. *beecheyi* sp. nov.

Pale testaceous; face (and scutellum except the keels and the apical fourth) irregularly suffused with pale purplish-brown, and four lateral spots at union of frons and vertex. Posterior angle of scutellum whitish. Tegmina hyaline milky, veins whitish with pale hairs, the cross-veins on apical half suffusedly fuscous; tegmina strongly and prominently granulate with dark

fuscous, an oblique dark fuscous band on apical half and several short irregular markings; apical veins subsuffused. Legs pale, with brown annulations.

Female: abdomen short, tegmina extending about as far beyond the abdomen as the length of the hopper.

Var. *fuscata,* nov.

Like the type, but scutellum not suffused with fuscous; tegmina much darker and suffused all over with fuscous.

Length 5½ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

Named after Captain William Beechey who voyaged in the Pacific in the "Blossom."

Australoma gen. nov.

Somewhat like *Kinnara* (which is a Cixiine, not an Achilid), but there is no third ocellus, the pronotum is more deeply emarginate, and the scutellum, much longer; the venation different, etc. Vertex nearly square, margins elevated, disk greatly depressed, basal margin slightly emarginate. Frons shaped much as in *Kinnara,* but a little wider basally. Tegmina vertical. Hind tibiae spineless.

1. *australna* sp. nov.

Pl. VIII, figs. 16-18.

Testaceous, tinged with ferruginous, paler beneath. Ocelli ruby-red. Tegmina hyaline, veins pale with brown granules, a few dark marks near the edge of the tegmen, as shown in the figure.

Length 5 mill.

Hab. Queensland, Kuranda (Aug.)

Quirosia gen. nov.

Allied to *Australoma* but the vertex is much smaller and narrower, anteriorly is angular, and has two small pit-like depressions anteriorly, base truncate. Frons as in *Dystheatias.* Tegminal venation not importantly different from that of *Australoma.*

Named in honor of P. F. de Quiros, voyager in the Pacific.

1. *vitiensis* sp. nov.

Sordid testaceous. Tegmina hyaline, tinged with sordid yellowish, veins and stigma paler, granules on anal vein dark. Wings hyaline, veins fuscous.

Length 5 mill.

Hab. Viti Levu, Rewa (Mar., M.).

Nesochlamys gen. nov.

Differs from *Gelastocephalus* by the quite different head and by the not so strongly compressed tegmina. Frons acutely carinate medianly.

1. *vitiensis* sp. nov.

Fuscous, the head keels yellowish. Clypeus, labium and legs whitish. Pronotum and scutellum dark fuscous, the hind angle of the latter minutely white. Clavus yellowish-brown, the apex fuscous, rest of tegmen dark fuscous or blackish except a semi-circular spot near the apex, from the subcostal margin to the middle of the tegmen. Abdomen mostly dark fuscous.

Length $3\frac{3}{4}$-$4\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar. Apr. Nov., M.), Navua (Feb., M.).

The following have also been described from Australia:

Brixia migratoria Distant 1907 A. M. N. H., (7) XIX, 279, Queensland.

Cixius merula Distant, op. cit., 284. Queensland.

Achilini.

As stated elsewhere, I regard *Kimara* as a Cixiine; *Vekunta* is certainly an Issine and has nothing to do with Achilini.

Mr. Muir has collected 2 genera and 8 species in Fiji.

The following table will separate the Australo-Fijian genera:

1 Pronotum produced apically as far as the apical margin of the eyes; subcostal cell dilated; length 11 mill..14 *Ancipo*

1a Pronotum not produced apically nearly as far as the apical margin of the eyes; subcostal cell not dilated; length not over 7 mill.....(2)

2 Frons strongly impressed transversely; not (or very obsolescently) carinate; an opaque white band on the face.... ..... 13 *Aristyllis*

2a Frons not transversely impressed; more or less strongly carinate medianly .....(3)

3 Lateral keels of frons meeting at its base and forming an angle there. .....(4)

3a Lateral keels of frons not meeting directly at its base, which is more or less widely truncate (or slightly produced laterally ..... (5)

4 Vertex not longer than the eyes; genae foliaceous; eyes not nearly touching the lateral margins.....12 *Majella*

4a Vertex longer than the eyes, genae not foliaceous; eyes practically touching lateral margins.....11 *Callichlamys*

5 Vertex longitudinally impressed, with a further circular impression in the middle.....10 *Francesca*

5a Vertex often longitudinally impressed (entirely, or between the keels) but not further impressed circularly.....(6)

6 Two opaque white bands across the face.....(7)

6a Face not banded.....(8)

7 Vertex not carinate medianly, very transverse, apical margin not nearly touching apical margin of head dorsally and not connected therewith by keels.....9 *Pyrrhyllis*

7a Vertex carinate medianly, not transvere, apex touching the apical margin of the head dorsally.....8 *Benella*

8 Vertex transverse. .....7 *Achilus*

8a Vertex not transverse.....(9)

9 3 to 4 middle apical cells of tegmina distinctly longer than wide. ..... (10)

9a 3 to 4 middle apical cells of tegmina not (or scarcely) longer than wide .....6 *Salemina*

10 Frons basally slightly angularly produced laterally..... ..... 5 *Argelcusa*

10a Frons basally truncate (or if very slightly produced angulately at the sides, then also similarly in the middle)..(11)

11 Vertex very lightly impressed longitudinally on each side of the middle keel, which is strong.....(12)

11a Vertex deeply impressed longitudinally, not (or feebly) keeled. .....4 *Callinesia*

12 Lateral keels of vertex anterolaterally obtuse angled..... ..... 3 *Eurynomeus*

12a Lateral keels of vertex meeting anteriorly acutely or roundly-acutely. ..... (13)

13 Apical cells of tegmina distinctly declivous, tegminal veins granulate. .....2 *Cythna*

13a Apical cells not (or very slightly) declivous, tegminal veins not granulate. .....1 *Phenelia*

Phenelia.

Mr. Muir has collected two species which I place provisionally here. *Phenelia* seems to form two subgenera:

1 Vertical keels very strong, intracarinal areas very narrow; lateral keels of vertex meeting acutely.....
.....(a) *Phenelia* sens. str., type *clidipteroides*

1a Vertical keels feebler, intracarinal areas wide; lateral keels meeting roundly-acutely anteriorly. (b) *Nephelia*, type *bicuneata.*

The two species of *Nephelia*, are easily separable by the colour:

1 Tegminal veins pallid.....2 *bicuneata*

1a Tegminal veins blackish.....3 *tristis*

2. *bicuneata* sp. nov.

Male. Brownish-yellow, abdomen and body beneath paler. Tegmina yellowish hyaline with 2 subopaque yellowish wedges, very narrowly bordered with fuscous, near the apex of the subcostal cell and a blackish-brown speck in the second apical cell; veins pale except the stem and inner fork of the radial vein, the claval veins, &c., which are yellowish-brown. Vertex about $2\frac{1}{2}$ times as long as the pronotum, produced before the eyes.

Length $3\frac{7}{8}$ mill.

Hab. Viti Levu, Rewa (Mar., M.).

3. *tristis*, sp. nov.

Male: form of the last, but the vertex shorter, scarcely produced in front of the eyes. Pitchy, paler below. Tegmina dark smoky, with 2 black-bordered white wedges near the apex of the subcostal cell.

Length $3\frac{1}{8}$ mill.

Hab. Viti Levu, Rewa (Apr., M.).

Eurynomeus.

This may possibly be the genus *Tangina,* but the frons is laterally sinuate and the radial vein is forked apically. I am inclined to think Melichar's figures faulty.

1. *australiae.*

Pl. IX, figs. 7-8.

Callinesia gen. nov.

This genus is very close to *Phenelia* and *Eurynomeus,* but is distinguished by the structure of the vertex as stated in the analytical table of the Achiline genera. A black spot always present on the mesopleura. Type *pulchra.* The four species—all from Fiji—are separable thus:

1 Clavus and corium bright red striped with yellow..1 *pulchra*
1a No bright red stripes on the tegmen.....(2)
2 Clavus and corium yellowish with pale brownish stripes; clypeus pale.....(3)
2a Clavus and corium greenish yellow with silver-grey or brownish stripes; clypeus black .....2 *ornata*
3 Clavus and corium yellow with broad pale fawn bands..... .....3 *venusta*
3a Clavus and corium yellowish with narrow orange brown lines ..... 4 *pusilla*

1. *pulchra* sp. nov.

Pl. IX, fig. 17.

Yellow, legs and beneath paler; junction of vertex and frons with a black horseshoe, a black dot on the vertex laterally. Eyes black. Pronotum with a sanguineous spot anteriorly. Scutellum with an angulate sanguineous stripe which passes over on to the base of the tegmina, which are sanguineous with the following bright yellow marks; a broad basal stripe, running from the middle of the basal margin to the subcostal margin; an elongate straight spot from commissure (at posterior angle of scutellum) half way across the tegmen; an oblique entire median stripe runing subparallel to the basal margin, and 3 lateral or sublateral spots apical of that, the apical one at least being margined interiorly with fuscous. Apical and subapical cells hyaline (some of the outer ones suffsued sanguineously) with sanguineous veins. Vertex deeply impressed, middle keel obsolescent. Labium reaching to middle coxae.

Length 4½ mill.

Hab. Viti Levu, Rewa (Mar.-Apr.).

2. *ornata* sp. nov.

Fulvescent or yellowish testaceous, the head marked as in *C. pulchra.* Eyes and clypeus black. Posterior two-thirds of scu-

tellum intracarinally black (or silvery grey.) Tegmina fulvescent or yellowish, with fulvous veins, an oblque silvery grey (or brownish) oblique band near the base and a large spot of the same colour near the middle exteriorly. Apical cells smoky silvery. Wings parly smoky, partly margined very narrowly with canguineous, veins smoky. Sternites black, pleurites margined with sanguineous. Head as in *C. pulchra.*

Length $4\frac{1}{2}$-$4\frac{5}{8}$ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

3. *venusta* sp. nov.

Ivory coloured, vertex with a tiny black streak on each side of the middle keel anteriorly and a black speck on the gena close to the eye. Eyes reddish or pinkish. Pronotum with one and scutellum with 3, orange brown spots on each side of the middle keel. Tegmina with two more or less well formed pale fawn transverse bands and one or two lines; one or two blackish lines on and beyond the subcostal cell apically. Wings hyaline, veins blood-red. Vertex a little less deeply impressed than in the preceding, middle keel clearer.

Length 4-$4\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

4. *pusilla* sp. nov.

Orange testaceous, paler beneath; vertex with a black V anteriorly, and 3 black specks on the gena. Eyes red. Pronotum with an orange-brown spot on each side; scutellum with 2 interrupted narrow transverse orange-brown lines. Basal half of tegmen pale yellow with a transverse hyaline band and about five undulating orange-brown transverse lines. Apical half of tegmen smoky hyaline, veins whitish, some a little tinged with blood-red. Subcostal cell basally yellow, apically hyaline with 2 yellow wedges, basally bordered with black very narrowly. Wings hyaline, veins very pale sanguineous. Head as in *C. pulchra.*

Length 4 mill.

Hab. Viti Levu, Rewa (Mar., Muir).

Francesca.

Francesca saleminophila is now figured. (Pl. VII, figs. 18-19.)

Callichlamys gen. nov.

Apparently allied to *Cnidus* by the elongate-oval eyes; has somewhat the appearance of *Pseudohelicoptera*.

Vertex narrowing gently towards the rounded apex, flattened along the entire length and medianly carniate. Eyes elongate oval, not as long as the vertex and decumbent on the pronotum Frons sinuate laterally, medianly carinate; clypeus small, labium reaching to about the base of the middle coxae. Pronotum anteriorly subtruncate, posteriorly angularly emarginate. Pronotum and scutellum tricarinate. The radial vein forks a trifle nearer to the base than the brachial; subapical cells present; apical cells elongate. Hind femora with a small spine.

There are two species:

1 Vertex more than twice as long as an eye.....1 *muiri.*
1a Vertex scarcely longer than an eye.....2 *undulata*

1. *muiri* sp, nov.

Pl. IX, fig. 20.

Sordid whitish, vertex with 2 subcontiguous dark fuscous lines on the apical half, clypeus fuscate. Pronotum and scutellum rosily suffused discally. Tegmina hyaline, tinged with yellow, suffused with sanguineous especially on the subcostal and radical cells and clavus, also on the apical half of the apical cells; veins sanguineous; the nodal veins fuscous, the basal one bordered with yellow and a dark fuscous spot at the base of the second apical cell.

Length $4\frac{5}{8}$-$5\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir's No. 204).

2. *undulata* sp. nov.

Male: head, pronotum and scutellum pale yellow; 2 subcontiguous blackish elongate narrow spots (sometimes merging) close to apex of vertex; clypeus brownish; 2 brown spots on pronotum; 4 brown spots (2 in a row each side of middle line) on scutellum between lateral keels, scutellum laterally brownish. Tegmina whitish, very narrowly margined at least apically with dark sanguineous, with about 4 oblique, partly a little obscure, interrupted, brown rows of stripes; subcostal cell with 2 yellow wedges near the apex, margined with brown. Apical cells

smoky, veins partly pale. Legs mostly yellowish-white. Sternites black.

Length 4 mill.

Hab. Viti Levu, Rewa (Mar., M.).

Aristyllis.

The following species are now figured:

A. aristyllis, Pl. IX, figs. 3-4.

A. omphale, Pl. IX, figs. 1-2.

A. adippe, Pl. IX, figs. 5-6 (the type is a little immature, consequently the frontal structure is a little obscure.

Aneipo.

Aneipo Kirkaldy.

=*Tudca* Distant op. c., 290.

1. *diva.*

A. diva Kirkaldy.

=*T. picturata* Distant, l. c.

The following have been described as Achilinae:

Mahuna conspersa Distant 1907, op. c., 290 Queensland.

Ouvea doddi Dist., op. c., 292, do.

Talaloa pallescens Dist., op. c., 295, do.

Dictyophorini.

Distant has recently described the following:

Dictyophara (sic!) *prognatha* 1906 A. M. N. H. (7) XVIII, 352, Queensland. He also (probably incorrectly) confirms a species of Walker's in the same genus, viz:

D. concolor Walker 1851 List 322; Distant l. c., North Australia, Queensland and South Australia.

Distant, following Stal, incorrectly places *Leusaba* in the Tropiduchinae; the absence of a well developed costal vein, however, and the running of the anal vein into the commissure just basal of the apex of the clavus, places this genus in the Dictyophorinae. The genus *Augila* placed by Stal and Distant in the Issinae, certainly has no place there; it probably belongs to the Dictyophorinae.

In the A. M. N. H. (7), XIX, 415, Distant boldly synonymizes *Thanatodictya lucindae* Kirk. with *Dictyophora bifasciata* Dist., and

T. anadyomene Kirk. with *D. insignis* Dist., but he rather unfairly omits to mention that the likelihood of these synonyms was indicated by me at the same time. I thing the latter pair are likely to be united, though they could not be from Distant's description. In the case of the former, *D. bifasciata* is said to have ochraceous sternites, while in *T. lucindae*, they are almost black, in both sexes and in a good series. For the present, therefore, I decline to accept Distant's synonym. In any case, the reference of these forms to the genus *Dictyophora* (or *Dictyophara* as Distant incorrectly cites it) is absurd.

Fulgorinae.

Eurystheus perkinsi.

This species was taken on a species of *Casuarina*.

Eurinopsyche.

I unfortunately said (p. 389) that the tegmina are decumbent; on the contrary they are scarcely tectiform, it is the tegmina in *Eurystheus* that are subdecumbent. *E. obscurata* was taken from "Queensland native plum."

Three new species have since been described from Australia by Distant, who has indeed included them in *Eurystheus*, but as he compares them with *E. dilatata*, it is to be presumed they belong to *Eurinopsyche*.

2. *doddi* Distant 1903 A. M. N. H. (7) XVIII, 19 (Queensland.)
3. *clementi* l. c. (West Australia.)
4. *pallescens* op. c., 20 (West Australia.)

Distant has also (26-9) described from Australia two supposedly new genera with three species, viz:

1. *Galela parva* (West Australia.)
2. *G. abdominalis* (Colony not stated.)
3. *Erilla turneri* (Queensland.)

N. B. *Desudaba maculata* and the other species in Distant's paper cited (390 etc.), were published 1893 (Jan.), not 1892 (Dec.).

On Pl. VII, figs. 7-8, a nymph of a Fulgorine is figured. The adult is unknown. In fig. 8 the sublateral keels are shown a little too strongly and the anterior sensory organs have been omitted.

Asiracidae.

The most obvious character of this family is the *mobile* spur at the base of the hind tibiae. Its most primitive form is probably seen in *Ugyops, Asiraca,* &c., in which it is awlshaped, the margins not serrate or dentate. There are two further types, as mentioned further on.

The Asiracidae probably—almost certainly—are derived from Cixiinae, but the mobile spur and the nature of the antennal sensory organs necessitate the maintenance of a special family for them.

Head.

In all known Asiracid nymphs, the frons has two keels down the middle, and the entire head is studded with sensory pustules. In the adult *Achorotile,* both these characters obtain, and this genus is therefore reasonably considered to be the most primitive known Asiracid. The first step of importance in the development of the family is in the fusion, almost wholly or in part, of the median keels of the frons; in some forms, they are completely fused almost to the connecting keels, in others, only as far back as the apical margin of the eyes. *Laccocara* has the nymphal pustules, but has partially fused frontal keels. These are the only two Asiracid genera known to me which have punctured pustules in the adults. Of other head characters, the most obvious is the form of the antennae; in the majority of forms, the first segment is short and cylindrical or annuliform, the segment being subcylindrical and not, or not noticeably, furished with sensory organs; in others they are varyingly flattened and dilated, elongate, and so forth.

The clypeus is sometimes carinate, sometimes not. The genal keel sometimes meets the frontal keel acutely at the apical margin, sometimes does not meet it. In one form, *Paranda,* the vertex is smoothly rounded in front, not (or feebly) carinate, and this must perhaps be regarded as a more or less degraded form.

Thorax.

Great stress has been placed on the lateral keels of the pronotum, two categories being supposed, viz.:

1. Lateral keels straight, meeting the hind margin,
2. Lateral keels curved, not meeting the hind margin.

Very often however the keels fork *near* the hind margin, one fork reaching the hind margin while the other curves outwards. The scutellum of the mesonotum may be 1, 3, 4 or 5 keeled; this is useful for generic separation.

Venation.

The venation is of comparatively little importance, as it is often very variable, especially in the apical cells. The brachial and radial are nearly always forked near the subapical line. The median vein continues direct to the apical margin of the tegmen in *Asiraca, Conomelus, Criomorphus, Tropidocephala* and *Metropis,* but ends at the subapical line in *Jassidaeus, Delphacodes* and its allies. The wings have (generally in the long-winged forms at least) a small stridulatory area. (See "Introduction.")

Legs.

The legs afford good characters.

In *Asiraca*, and *Phyllodinus*, the fore pair are dilated, in other genera, however, they are cylindric.

A good character is afforded by the mobile spur of the hind tibiae, which has not up to the present been fully utilized. There are three principal forms:

(1) probably the original, in which it is simple, awl-shaped. not provided with a fringe of teeth, but only one apical tooth. This occurs in *Asiraca, Melanesia and Ugyops.*

(2) the usual form; large, bilaminate, with a row of many, very feeble, minute teeth; the species are probable grass-feeders.

(3) solid, subcultrate, elongate, narrow and strongly compressed, with a row of a few, large, strong teeth. This form is that of all the endemic Hawaiian species, but otherwise only known to me in *Proterosydne*, an Australian genus.

As the Hawaiian forms are all arboreal, this may be the characteristic spur of arboreal species.

Genitalia.

The genitalia in the male are the final test of a species and even afford generic criteria.

(a) Male genital segments.

The terminal segment in the male is in the form of a chitinous cylinder, whose profile often affords good specific characters; this is the pygophor. On looking at this from behind, it is seen to be divided into two parts, a smaller dorsal cavity, the anal tube; and a larger ventral one, the genital tube.

The anal tube contains the mobile anal style,* while the genital tube contains the following:

(1) the mobile genital styles which are articulated near the ventral margin, being situated more or less horizontally on looking into the tube.

(2) the oedeagus, which is situated about the middle of the pygophor and is more or less vertical on looking into the tube, so that the pygophor must be tilted to observe the former properly. It is perforated by the muscular, protrusible, penis;

(3) the lateral margins of the pygophor are often thickened and dilated and also interiorly produced into hooks or spines. There are also hooks or spines close to, or proceeding from, the wall between the anal tube and the genital tube, and also on the posterior margin of the pygophor.

The following is a partial synonymy of the parts:

1 Pygophor=Pygofer Edwards=*Aftertraeger* Fieber=*Vulvar appendix* Signoret=*Hypopygium* Kolenati.

2 Anal Tube=*Anterior part of the segment* Sharp=*Afterrohr* Melichar..

3 Anal Style=*Rectal cauda* Sharp=*Afterstielchen* Fieber. This is the termination of the alimentary canal.

4 Diaphragm=*The transverse deflected wall separating the anal tube from the genital tube* (Sharp).

5 Oedeagus=*Porte penis* Fieber=*Penistrager* Melichar. This is the "part of the male organs through which pass the membranous structures connected with the ejaculatory duct."

6 Genital Styles=*Lateral accessory pieces* Sharp=*Styli* and *Griffel* Fieber=*Cerci* of some authors.

7 Ventral Margin of Pygophor=*Posterior edge of segment*=*Lip* Sharp.

The various hooks are not specially named.

* This has sometimes been omitted in the drawings.

In almost all the species hereafter described, the male pygophor is briefly described, but the figures should also be referred to. In connection with both descriptions and figures, it must be remembered that the pygophor is not always, or even often, straightly truncate apically, that the different pieces do not necessarily lie in the same plane, and, moreover, that they are partly mobile. Consequently when comparing with suspected specimens, the latter should be carefully examined from several points of view. The figures have almost all been drawn when the genital styles, usually the most important part, are as flat to the eye, as possible.

(b) Female Genitalia.

I have not specially studied these, and have not used them in the descriptions, but they appear to present slight specific differences in the lengths of the segments.

The Australo-Fijian Genera may be disposed as follows:-

1 Tibial spur awl-shaped, with concave sides, and one (apical) spine ..... (2)

1a Tibial spur bilaminate, or at least tectiform, with several feeble spines on the lower edge ..... (3)

1b Tibial spur subcultrate, solid, elongate, strongly compressed with 8 strong spines..... 3 *Protcrosydne*

2 Antennae very long, second segment one half longer than the first, frontal keels uniting about the middle of the frons ..... 1 *Ugyops*

2a Antennae shorter, with the second segment 3 times longer than the first, frontal keels uniting close to the base of the frons ..... 2 *Melanesia*

3 Antennae cylindric; male pygophor not spined on the ventral margin ..... (4)

3a First segment of antennae flattened and much widened apically; male pygophor with 2 spines on the ventral margin ..... 7 *Perkinsiella*

4 Frons with 2 outwardly rounded keels, uniting at base and apex (if at all)..... 4 *Criomorphus*

4a Frons with 2 keels uniting not apical of the lower margin of the eyes ..... (5)

5 Head dorsally at least twice as long as wide..... (6)

5a Head dorsally less than twice as long as wide..... (8)

6 Hind margin of head sinuate ..... 8 *Stenocranus*

6a Hind margin of head truncate ..... (7)

7 No connecting (transverse or oblique) keels on vertex.... ..... 10 *Tropidocephala*

7a Transverse or oblique submedian keels on the vertex.... ..... 9 *Hadeodelphax*

8 Frontal keels uniting apical of one-fourth of the length of the eyes frontally .....(9)

8a Frontal keels uniting not apical of that.....(11)

9 Head rounded anteriorly, keels on frons very feeble.... ..... 11 *Anectopia*

9a Head with strong keels .....(10)

10 Lateral keels of pronotum straight, or curving very slightly inwards, reaching the posterior-margin; male pygophor without spines on the ventral wall of the anal tube.... ..... 5 *Peregrinus*

10a Lateral keels curving outwards under the eyes; male pygophor with spines on the ventral wall of the anal tube ..... 6 *Dicranotropis*

11 Lateral margin of vertex roundly arched, not carinate, meeting anteriorly roundedly, the central dorsal area long triangular, strongly keeled .....12 *Haplodelphax*

11a Lateral margins of vertex more or less straight and keeled ..... (12)

12 Male pygophor with the ventral margin deeply emarginate 3 or 4 times.....15 *Megamelus*

12a Male pygophor not emarginate on the ventral margin more than once .....13 *Gelastodelphax*, 14 *Smicrotatodelphax* and 16 *Delphacodes*

Ugyops.

Ugyops Guerin 1834 Voy. Belanger Zool. IV 477.

This genus is distributed over the Oriental Region and one species was described from Ponape in the Carolines; a new species is now added from Fiji.

1. *vitiensis*, sp. nov.

Pale sordid stramineous, suffused in places with a rosy hue, apical half of second segment of antennae infuscate. Keels of head and scutellum very narrowly dark. Pronotum discally fuscous. Tegmina hyaline, tinged with a smoky hue in parts, subcostal vein pale, other veins dark fuscous, occasionally annulate with yellowish white; apical cells sparsely fuscous in parts,

especially apically; claval veins irregularly suffused. Wing hyaline, veins blackish brown, apical margin fuscate. Tergites marked with fuscous. Vertex deeply emarginate, the truncate base being apical of the middle of the eyes (dorsally). Frons much as in Stal's figure of *U. kinbergi,* but the central keels are not so prominent basally and are less distant; the lateral margins are more evenly rounded towards the clypeus which is clearly sutured off from the frons. Second segment of antennae one-half longer than the first. Labium long, reaching to about the hind coxae. Tibial spur awl-shaped with 3 hollow sides, only one (an apical) spine.

Female: pygophor pale yellowish; ovipositor apically fuscous, about as long as the nota and the rest of the abdomen.

Length 9¾ mill.

Hab. Viti Levu (No. 133 Muir Mar. '06) arboreal.

Melanesia, gen. nov.

Head dorsally a little longer than wide, vertex transverse, irregularly shaped, with two fairly deep but obscurely defined foveae; frons about twice and a half as long as wide, apically and basally truncate, a single filiform keel forking close to the base, lateral margins widening a little towards the apex but narrowing slightly at the apical margin. Genae not carinate. Labium reaching beyond the fore coxae. Antennae long and reaching to about the middle of the clypeus, somewhat flattened, with few circular sensory organs, but many short bristles; second segment three times as long as the first; which is rather wider apically than basally. Pronotum very transverse, lateral keels curving under the eyes. Scutellum four times as long as the pronotum, with 5 keels. Tegmina with the radial vein forking much closer to the base than the brachial, reforked basal of the subapical transverse line; somewhat apical of the middle, the tegmina are bent in and there is a cross vein which cuts across the longitudinal ones, turning off obliquely towards the apex about the middle and turning off again, close to the apex of the clavus, into the commissure. Tegmina closely and finely granulated both on and between the shortly piliferous veins; there are 10 apical veins, 4th and 5th reforking, 7, 8, and 9 having a common base. Hind tibiae longer than the tarsi, with a basal spine and another basal of the middle; spur much as in *Ugyops;* basal segment of hind tarsi much longer than the other two together.

1. *pacifica,* sp. nov.

Pl. XVII, figs. 13-14.

Vertex, pronotum and scutellum yellowish fuscous, keels a little darker; face yellowish, lateral keels very narrowly blackish-brown; antennae, labium legs, sterna, &c., brownish-yellow, the fore and middle tibiae obscurely biannulate with fuscous; apices of first and second segments of hind tarsi, more or less dark. Tegmina brownish-yellow, a small dark spot about the middle of the clavus; apical margin dark and often the subcostal also.

Male: sternites more or less ferruginous; last segment deeply rotundately emarginate; pygophor elongate, very sinuate in profile; anal tube elongately produced in a horizontal direction. Genital styles contiguous inwardly for a third of their length, then curving outwards and recurving, apices acute, nearly contiguous. The entire male pygophor is very peculiar and very difficult to describe, but the figures show clearly the salient characters.

Female: sternites yellowish-brown, sutured with black, few last segments deeply acute-angularly emarginate, ovipositor dark, much longer than pygophor.

Var. *strigata* nov.

Female: a broad blackish-brown stripe down the tegmen from base to apex, slightly outside the middle.

Length 6¼-6½ mill.

Hab. Fiji (March, Muir's Nos. 111, 114 and 145), Navua (Feb. M), Rewa (March M), arboreal.

Purohita Distant.

1906 Faun. Ind., Rh. III, 465 & 470.

This genus must be placed in the neighborhood of *Asiraca* on account of the structure of the antennae and tibial spur, though the latter shows some alliance with *Perkinsiella* &c. The hopper has a close superficial resemblance to *Oliarus.*

1. *arundinacea* Distant.

1907 E. M. M., XLIII, 10.

I am obliged to Messrs. Mann and Antrim for specimens of this pretty little hopper. Beyond the greater length of the sec-

ond segment of the antennae, it differs from *P. cervina* by the radial and brachial veins of the tegmen being forked at about the same distance from its base, while in *P. cervina* the radial is forked much nearer the base. I still further supplement Distant's superficial descriptions by figures of the male genitalia; male pygophor of irregular shape, very deeply and elongately emarginate ventrally; the anal tube forms a kind of hood, covering over the genital styes, which are acutely elongate. (Pl. XV, figs. 6-8).

Proterosydyne, gen. nov.

Distinguished by the absence of connecting keels on the vertex, the very large eyes, and the peculiar tibial spur.

Vertex subtriangular (the anterior and posterior halves of the lateral margins very obtuse angled, so that, although the vertex is really 5-hedral, it may be said to be triangular), with no median or connecting keels; lateral keels not quite contiguous apically, almost enclosing an elongate exceedingly narrow space before uniting about the apical margin (frontally) of the eyes. Between the apex of the vertex and this forking, the head is highly polished and the keels rather obscure, otherwise the keels are all well marked. The median keel reaches the apical margin of the frons, which is a little emarginate roundedly. Vertex deeply concave, about as long as wide and does not extend as far anteriorly as the yes, thus displaying a rounded frontal margin. Frons rather narrow, elongate, subparallelsided, slightly rounded exteriorly. Middle keel of genae meets lateral margins of frons at an acute angle at the apical margin of the frons; clypeus rather feebly tricarinate. Head not decumbent on the pronotum anterolaterally. Eyes very large, about as wide as vertex, longer than wide. Antennae subcylindric, long, reaching almost to apex of clypeus, second segment scarcely more than twice as long as the first, a little wider apically than basally, flagellum much longer than peduncle. Pronotum longer than vertex, narrower apically than the vertex basally, strongly tricarinate, lateral keels straight, reaching posterior margin, not contiguous anteriorly; posterior margin slightly, obtuse-angularly, emarginate posteriorly. Scutellum with anterior three-fourths of disk roundly convex and polished, posterior fourth flat, rather obscurely tricarinate, middle keel not reaching the flat part. Tegmina (brachypterous form only known) granulate, reaching be-

yond apical margin of last pleurite. Wings rudimentary, reaching very little beyond base of metanotum. Hind tibiae with 2 spines (1 basal), nearly one-half longer than tarsi; spur solid, elongate, narrow, with 8 spines. First segment of hind tarsi longer than the others together.

1. *arborea* sp. nov.

Pl. XVIII, figs. 11-12.

Basal part of vertex, the clypeus, pronotum, scutellum anterolaterally and basally, metanotum, sterna, legs, etc., pale yellow-brown. Apical part of vertex, basal two-thirds of frons, a large round spot on disk of scutellum, polished black. Antennae pale brown, second segment more or less infuscate. Apical third of frons whitish. Tegmina hyaline, basal half tinged with yellowish-brown, a large hyaline spot in the middle (with a short, dark, transverse stripe at base), which, when the tegmina are closed, discloses the tiny, opaque white wings. Tergites blackish, basally reddish testaceous, apically with a pale yellow-brown, elongate wedge; apical margin of last three tergites sanguineous.

Female: sternites pale brown, ovipositor blackish. Last tergite longer than the proceeding segment, apically roundly produced.

Length 2½ mill.

Hab. Queensland, (Koebele 2302).

Only a single female, unfortunately, of this very distinct form.

Criomorphus.

Criomorphus Curtis 1833 Ent. Mag I, 195.

Stiroma Fieber 1866 Verh. Zool. bot. Ges. Wien XVI (?=subgen.)

Ditropis Kirschbaum 1868 Jahrb. Nass. Ver. Nat. XXI-XXII. p. 11.

Eurybregma Scott 1875 E. M. M. XII, 92.

A somewhat heterogeneous assemblage, some of the forms of which seem not far from being directly in the line of descent of *Dicranotropis*. The pygophor is destitute of spines or hooks on the ventral margin.

1. *australiae* sp. nov.

Differs from most of the other species included in *Criomorphus* by the frontal keels being separated, though close together,

during their entire length; the antennae reach beyond the base of the clypeus. Dark fuscous or pitchy, frons and legs a little paler, the former with 5 or 6 tiny paler spots on each side; clypeal keels and lateral keels of frons, antennae, markings on legs, &c., brownish testaceous. Tegmina hyaline.

Male: pygophor pitchy.

Length $3\frac{1}{3}$ mill.

Hab. Queensland, Brisbane (Nov., P.).

Peregrinus.

Peregrinus Kirkaldy 1904 Entom. XXXVII, 175 and 1906 Bull. H. S. P. A. Ent. I, 407.

=*Pundaluoya* (pt.) Distant 1906 F. B. I, III, 467.

This genus agrees with *Dicranotropis* in the forking of the front, in the antennae, in the non-contiguity of the frontal and genal keels apically, in the ocelli not nearly touching the lateral keel of the frons, but being situated close to or touching the eyes, and in the form of the tibial spur. It differs chiefly in the tegminal and alar venation in the macropterous forms, and in the lateral keels of the pronotum which practically reach the hind margin and curve inwards here rather than outwards. The second and third apical veins have a common stalk, the latter being re-forked. The pygophor has no spines or hooks on the ventral margin in the males, nor on the ventral wall of the anal tube.

1. *maidis.*

Pl. XII, figs. 7-8 & Pl. X, f. 14.

This has further been recorded from the Antilles by Ballou, from Ceylon (under the names of *Liburnia psylloides* and *Pundaluoya simplicia*) by Distant, and Mr. Muir has taken it from grass in Fiji, Rewa (Mar.-Apr.-Nov., No. 6). Mr. Van Deventer has sent it to me from Java.

Dicranotropis.

In the males, the ventral margin of the pygophor is without hooks, but there are some on the ventral wall of the anal tube.

The 5 Australasio-Oriental species known to me may be disposed as follows:

(a) Longwinged forms:

1 Tegmina maculate .....(2)
1a Tegmina practically immaculate .....(3)
2 Tegmina strongly granulate, apically with a semicircular stripe and 2 short, straight stripes .....3 *koebelei*
2a Tegmina feebly granulate, apically with a straight stripe.. ..... 4 *muiri*
3 Apical veins dark, slightly infuscate .....1 *anderida*
3a Apical veins pale .....2 *aristoxenus*

(b) Shortwinged forms.

1 Tegminal veins pale, not granulate .....1 *anderida*
1a Tegminal veins with large, dark granules .....(2)
2 Frons apparently concolorously fuscotestaceous, fore tibiae black .....(?) 5 *nigropunctatus*
a Frons blackish brown with pale yellowish specks; fore tibiae brownish black, pallidly annulate .....3 *koebelei*

Many of the European genera seem to be but little differentiated from *Criomorphus,* for ex., in the form of the frons, *Dicranotropis hamata* seems much nearer to *Delphacodes* than it does to *Dicranotropis beckeri.* (*)

anderida sp. nov.

Differs, beyond the points already mentioned, from any other *Dicranotropis,* by the head keels not being bordered at all with blackish, except *D. nigropunctata* Melichar, which has dark genae and dark lateral parts to the nota, &c. Orange brown, the keels of vertex and nota, and the parts exterior to the lateral keels of the nota mostly, pale yellowish testaceous. Frontal keels very narrowly bordered with pale yellowish orange, frontal specks the same colour. Antennae pale orange testaceous, apex of first segment dark fuscous. Tegmina pale yellowish hyaline, veins of basal two thirds mostly pale, of apical cells fuscous somewhat suffusedly. Frons elongate, narrower, subparallel, a little constricted basally, forked a little basal of the apical margin of the eyes. Tegminal veins very feebly granulate.

* I propose a new genus for this last species, viz.: *Leimonodite,* characterized by the frontal keels being separate till nearly the apical margin. From *Criomorphus* it differs by the longer and narrower frons, whose median keels are stalked apically. If this genus cannot be sustained, then *Delphacodes, Criomorphus, Dicranotropis* and several others, must be thrown together.

Shortwinged form: tegmina much as in *D. hamata*, the apical cells, or at least one of them, fuscous.

Female: abdomen more or less infuscate laterally.

Length 2½ (brachypterous), 4⅛ (macropterous) mill.

Hab. Queensland, Cairns (Aug., P.), Redlynch (July, P.), Brisbane (June, P.); Fiji, Rewa (Muir's No. 160, Mar.-Apr.), Ba (Jan., M.), Navua (Feb., M), on grass. I have seen females only.

2. *aristoxenus*, sp. nov.

Very close to the last, but a little smaller and coloured differently.

Pale yellowish testaceous, without orange colouration and the frons not (at least noticeably) maculate.

Tegmina pale yellow hyaline, veins uniformly pale testaceous, not granulate. Lateral margins of frons very slightly more rounded laterally and more constricted basally.

Length 3½ mill.

Hab. Queensland, Cairns (Aug., P.).

I have seen females, only, of this also.

3. *D. koebelei* (Kirkaldy).

Pl. VIII, figs. 9-10 & Pl. XVII, figs. 8-9.

Phacalastor koebelei Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 408.

Since my original description, I have seen a shortwinged female.

Dark fuscous; keels, spots on frons, second segment of antennae, intermediate and hind legs more or less, &c., yellowish testaceous. Tegmina cinereous (granulations dark fuscous), reaching to about half the length of the abdomen, apically rounded. The male pygophor is subtrotundate viewed end-on, the ventral margin projecting acutely in profile.

Length 2⅔ mill.

Hab. Fiji (March, K.).

4. *muiri* sp. nov.

Pl. XII, figs. 4-6.

Pale cinereo-testaceous, metanotum posteriorly yellow. Sternites blackish, laterally variegated with yellowish-brown, medianly sub-

sanguineous. Genital segments pale. Tegmina hyaline, veins whitish; second longitudinal apical cell smoky, apices of apical veins infuscate, also a short fuscous line near apex of commissure. Keels of frons forked about the middle of the eyes.

Male: pygophor beneath very deeply emarginate basally. Anal tube with a strong spine on each side overlooking the genital tube. Genital style elongate reaching from end to end. The oedeagus is remarkably long and is subhorizontal.

Length 4½ mill.

Hab. China, Wei Chou (Sept.).

I have great pleasure in naming this species after its discoverer.

Perkinsiella.

Perkinsiella Kirkaldy 1903 Entom. XXXVI, 179 and 1906 Bull. H. S. P. A. Ent. I, 404.

Phacalastor Kirkaldy op. c., 408. (part)

A derivative of *Dicranotropis* from which (& *Peregrinus*) it differs by the antennae being flattened and dilated, the apical margin of the first segment being much broader than the base; the genal and frontal keels meet acutely apically. The venation, and the form of the head and pronotum are similar to those of *Dicranotropis*. In the male the ventral margin of the pygophor has two hooks or spines of varying length and form, according to the species. The males of the six species known to me are easily distinguishable by the form of the pygophor, otherwise the species may be separated as follows: (*)

1 Frons with a more or less uniform ground colour, with transverse pale dots, &c. ..... (2)

1a Frons basally brownish, apically whitish, the two areas well contrasted, the former with pale dots ..... (3)

2 Frons pale brownish, with whitish dots basally and apically ..... 5 *vastatrix*

2a Frons piceous with brownish-yellow transverse dots, &c. ..... 1 *pseudomaidis*

3 Males ..... (4)

3a Females ..... (7)

* *Perkinsiella* is also closely related to the American *Stobaera*, but in the latter the head is distinctly narrower than the pronotum and the pygophor has no spines on the ventral margin in the male.

4 Scutellum laterally broadly dark brown .....(5)
4a Scutellum concolorous .....(6)
5 Tegmina feebly granulate .....3 *saccharicida*
5a Tegmina strongly granulate .....6 *sinensis*
6 Antennae shorter, granulation dark and stronger..... ..... 2 *graminicida*
6a Antennae longer, granulations paler and feebler..4 *vitiensis*
7 Longwinged forms ..... (8)
7a Shortwinged forms ..... (9)
8 Tegmina almost immaculate, some of the apical veins lightly suffusedly infuscate ..... 4 *vitiensis*
8a Median cell sometimes smoky, also 5th and 6th apical cells (except small hyaline spots at apex).....3 *saccharicida*
9 Antennae longer and stouter, tegminal granules comparatively feeble and paler .....3 *saccharicida*
9a Antennae shorter and less stout, tegminal granules stronger and darker .....2 *graminicida*

Table of known *nymphs* of the genus *Perkinsiella*.

1 Ground colour of frons darkish-brown with white marks: a dark brown stripe across the base of the tegminal and wing pads, apex of tegminal pad dark brown..... ..... 1 *pseudomaidis*
1a Frons dark basally with pale marks, pale apically; tegmina not striped transversely as above .....(2)
2 A conspicuous black spot at apex of abdomen on each side; tibial spur fuscous .....2 *graminicida*
2a No spot (or very inconspicuously) at apex of abdomen on each side; tibial spur pale .....(3)
3 Base of 1st segment of hind tarsi brown; clypeus blackish-brown ..... 4 *vitiensis*
3a First segment of hind tarsi entirely pale; clypeus pale fuscous ..... 3 *saccharicida*

The *nymph* of *sinensis* is not yet known; that of *vastatrix* has been briefly described by Breddin, but not so as to be included in the table.

1. *pseudomaidis*.

Pl. XII, figs. 1-3.

Phacalastor pseudomaidis Kirkaldy l. c.

This species tends to connect typical *Perkinsiella* with *Dicranotropis*, but still has the widened antennae. Mr. Muir has now

taken it in Fiji (Mar., Muir's No. 131), on *Saccharum officinarum*. The male pygophor has two, somewhat short, ventral spines, and in profile the ventral margin is acutely produced. The genital styles are somewhat twisted. The ventral wall of the anal tube has 4 spines, the dorsal being longer than the ventral. The contents of the pygophor have been drawn from a specimen in which they were not in repose.

2. *graminicida.*

Pl. XII, figs. 14-15.

The male pygophor has two very short spines on the "lip," and two long curved tusks from the ventral side of the anal tube. The genital styles are apically bispinose and the oedeagus is rather small.

3. *saccharicida.*

Pl. VIII, figs. 5-8, Pl. XII, figs. 11-13.

Dr. Van Deventer has kindly sent me examples from Java. In Pl. 17, fs. 1 and 4 of my former memoir, the obscure median keel of the scutellum was omitted.

The male pygophor has two broad spines, acuminate apically, on the "lip," and two upward curved tusks on the ventral side of the anal tube. The genital styles are broad and rather flat, bispinose apically. The oedeagus is rather long and has a triangular process on the middle of the "back."

4. *vitiensis.*

Pl. XII, figs. 9-10.

The "lip" spines in this are slender and very long. The genital styles are medianly branched, as well as bispinose apically. The oedeagus is long and broad. The spines on the anal tube are bifid.

5. *vastatrix.*

Pl. X, figs. 12-13.

Dr. Van Deventer has sent me a male of this from Java, where however it is apparently not the commonest species, this being

P. saccharicida. (*) The male just mentioned agrees with Breddin's description, whereas the one sent me years ago by the latter was a *Dicranotropis,* not agreeing with his description. The females then sent by Dr. Breddin were true *vastatrix.* The spines on the "lip" are very long and broad in profile. The genital styles are very remarkable, being much branched and apparently somewhat basin-like. The oedeagus seems to emerge much nearer the anal tube than usual. The spines from the latter are triangular and rather broad basally.

6. *sinensis* sp. nov.

Pl. X, figs. 14-15.

Male (*macropterous*) : differs from *saccharicida* by the strongly granulate tegmina and the genitalia. The clypeus is mostly dark brown. The paler and darker hues are brighter and more contrasted. The pygophor has long tusklike spines on the "lip," the genital styles are curiously twisted with a crumpled spine apically, the oedeagus is not unlike that of *vitiensis,* but rather shorter. The spines on the anal tube are long and slender.

Female (*brachypterous*) : tegmina with pale veins strongly granulate with dark brown; a dark brown spot at the base of the apical cells in the middle and one at the apex of the clavus.

Length (male) 4⅝ (female) 3¼ mill.

Hab. China: Wei Chou (Sept., Muir).

Stenocranus.

=? *Sogata* Distant 1903 Faun. Ind. Rh. III, 465 and 471, f. 258.

1. *agamopsyche.*

Pl. XI, figs. 1-4, and Pl. XVII, figs. 6-7.

This species is nearest to *dorsalis* (Fitch). The radial vein forks nearer to the base than the brachial, and there are 8 apical cells, the 4th and 7th being pedicellate.

The male pygophor is emarginate subdorsally and the outline is sinuate. The anal tube has an acute tooth on either side.

* See Kirkaldy "Descriptions et remarques sur quelques Homopteres..... vivant [s] sur la canne a sucre" A. S. E. Belg., L I, 123-7 (1907).

The genital styles are large and of peculiar form. The oedeagus seems to be double, or at least to have two hook-like processes.

The nymph is figured on Pl. XI, figs. 3-4.

2. *pacificus* sp. nov.

Pl. XV, figs. 4-5.

Pale yellow, a broad whitish median line down the middle from head anteriorly to hind margin of scutellum very narrowly bordered with orange-yellow. Frons, between the rather broad whitish keels, fuscous, this being visible dorsally. Mesopleuron with a black dot. Tegmina hyaline, tinged with yellow, veins pale yellow, fuscous at the apices of the apical veins. Eyes red-brown. Head much shorter than in *S. agamopsyche,* dorsally very slightly longer than the pronotum medially.

Male: pygophor yellow, emarginate ventrally.

Profile sinuate. Anal tube prominent, with a downwardly directed spine on each side far down. Genital styles contiguous at base, diverging thence, spined apically. Oedeagus elongate, subascendant, with a recurved process near the apex.

Female: pygophor yellow, ovipositor sheath paler.

Length (male) 4, (female) 4⅞ mill.

Hab. Viti Levu, Rewa (Mar., M.), Navua (Feb., M.), Ba (Jan., M.), (Muir's Nos. 54 and 140), on *Saccharum officinarum* and grass.

Saccharosydne, gen. nov.

Closely allied to *Stenocranus*, but whereas, in the latter the radial vein forks nearer to the base than does the brachial, in *Saccharosydne* the reverse is the case, the radial fork in the latter being very short. There are 7 apical cells, the 4th being pedicellate. The head dorsally is very similar to that of *Stenocranus*, but is angular in profile, the latter being rounded. In profile, the head is very similar in appearance to that of *Tropidocephala*, but the latter is at once separated by the absence of cross keels on the vertex. Tibial spur broad, usual type with many small teeth. Type *saccharivora* (Westwood).

1. *saccharivora*.

Aphis sacchari (p.) Anon., 1833 Mag. Nat. Hist., VI 407, f. 54b. [incorrect]—not described.

Delphax saccharivora Westwood, op. cit. 409, figs. 54*a* and *c* [incorrect]; and 1834 op. cit., VII 496 and 610; Ballou 1905 W. I. Bull., VI, 41 .

Stenocranus (?) *saccharivorus* Van Duzee 1897 Bull., Buffalo Soc., V, 232 and 1907 op. cit.

S. saccharivora Kirkaldy 1906 Bull. Ent. H. S. P. A., I, 409.

This species was originally confused with an Aphis (probably *A. sacchari* Zehntn., but I have not seen specimens).

It is easily recognized by its immaculate pale green colour; spur-spines, &c., black spur with 18-20 spines.

The nymphs differ but little from the adult, excepting the usual manner, and have 2 parallel keels on the frons, close together and not uniting.

Hadeodelphax.

There are at least two Australasian species:

1 Head in profile extending almost or quite the length of the eye in front of the latter.....1 *pluto*

1a Head in profile scarcely as much as half of the length of the eye, in front of the latter .....2 *persephone*

1. *pluto.*

Pl. XVII, fig. 12.

Macropterous form: the posterior angle of the scutellum is white, and the median keel of the pronotum is sometimes pale.

Male: pygophor sinuately rounded viewed from the end. The genital styles are recurved and broadly bifid at their ends.

Length (brach.) 3½, (macr.) 4¼ mill.

Hab. Queensland, Cairns, (July-Aug., P.), Lucinda Point (July, P.); Fiji, (Feb., K.), Navua (Feb., M.), Ba (Jan., M.), Rewa (Apr. and Dec., M.).

var. *pallidior* nov.

I hesitate to describe this as a species, as I have seen only females, and *H. pluto* is certainly subject to natural decoloration.

Macropterous form: Testaceous, frons piceous brown, more or less paler laterally; pronotum obscurely marked with pale brown and scutellum with an obscure longitudinal stripe on each

side of the middle. Tegmina faintly smoky, hyaline, veins mostly dark, first and second apical cells more or less colourless, fifth to eighth more or less dark smoky. Sterna paler than in the type.

Brachypterous form: Pale brownish testaceous, paler beneath; tegmina narrowly smoky apically, commissure whitish, brown near the apex of clavus.

Length (brach.) 2¾, (macr.) 4 mill.

Hab. Queensland, Cairns (Aug., P.); Fiji, (March, K.), Ba (Jan., M.), Rewa (Apr. and Dec., M.).

2. *persephone* sp. nov.

Pl. XVII, figs. 10-11.

Black; vertex, frontal keels dorsally, keels of pronotum and sides of the latter, central keel and posterior angle of scutellum, commissure (interrupted in the middle), whitish. Antennae and legs whitish or whitish testaceous. Tegmina dark smoky, first and second apical cells and the apex of the subcostal cell, hyaline, veins blackish-brown; wings hyaline, veins blackish-brown. The pronotum and scutellum are often more or less decolored (sometimes there are 2 black specks on apical margin of vertex). The vertex proper (basal compartment) does not extend anteriorly so far as the apical margin of the eyes.

Male: genital segments dark brownish. Inside margin of pygophor sinuate. The oedeagus serrate marginally. The genital styles are very irregular in form.

Female: genital segments dark brownish, ovipositor-sheath paler.

Length (brach.) 3, (macr.) 3½-4 mill.

Hab. Queensland, Cairns (July-Aug., P.).

Tropidocephala.

Tropidocephala Stal. 1853 O. V. A. F., XI 226 (type *flaviceps*).

Nephropsia A. Costa 1862 Ann. Mus. Zool. Napol. I 76 (type *elegans*).

Conicoda Matsumura 1900 Ent. Nachr., XXVI 258 (type *graminea*).

Orchesma Melichar 1903 Hom. Ceylon 94 (type *marginepunctata*).

Ectopiopterygodelphax Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 412. (type *eximius.*)

Smara Distant 1906 Faun. Ind. Rh. III, 478, (type *festiva*).

I think these are all synonymous. Tibiae apically with 5 short, black, equal spines as viewed ventrally; spur short, broad, a little concave on one side, without teeth.

Male: pygophor with one spine on or near the lip in the middle.

There are about a dozen species, distributed from Southern Europe to South Africa and to Australia and Japan. The three Australian forms may be differentiated as follows: (in all three, the tegminal veins are granulate and more or less hairy).

1 Nodule near the apex of median vein conspicuous, much larger than the one near the apex of radial, the median nodule split into two small ones which are not contiguous. Tegmina more or less dark with hyaline spots.....(2)

1a The brachial nodules seem a little uncertain. Tegmina pale, concolorous. Nodules are small, not very conspicuous.... ..... 3 *hamadryas*

2 Vertex about twice as long as pronotum, clavus dark smoky..... 2 *dryas*

2a Vertex little longer than pronotum. Clavus dark smoky but widely pale greenish along the sutural margin. 1 *eximius*

1. *eximius* (Kirkaldy).

Pl. XII, figs. 5-7, and Pl. XVII, figs. 15-16.

Add: Clavus more or less widely pale greenish along the sutural margin. Tegmina granulated with whitish, with short, stiff hairs. Genae black, clypeus pale. Antennae pale, marked with black.

The male pygophor is figured (Pl. XVII, figs. 15-16), but neither the artist nor myself has been quite able to make out the structure and I think the interior is partly filled with excretion. I have not had sufficient material for dissection. The lateral margins of the pygophor are greatly sinuate, being produced about the middle and also very curiously towards the dorsum. There is one rather blunt spine near the lip. The genital styles are slender and curve inwards somewhat. There are also two smaller spines dorsal of these, which seem to be appendages of the oedeagus.

Length $3\frac{1}{2}$-4 mill.

Hab. Queensland, Cairns (July-Aug., P.).

2. *dryas* sp. nov.

Pl. XII, figs. 1-4, and Pl. XVII, figs. 4-5.

Allied to *eximius*, but differs as follows:

Frons dark apically and basally, clypeus pale. Pronotum with a black spot at the side (sometimes obscurely indicated in *eximius*). Clavus concolorous, dark smoky. Vertex about twice as long as pronotum, frons narrower than in *eximius*, longer and curved in profile.

The *male* pygophor is very different in appearance from that of *T. eximius*, though the generic character of the single ventral spine is present. The form is more oblong, the sides sinuate and rather bluntly toothed laterally on the ventral margin. The genital styles are very long and curve twistingly near their apex.

The oedeagus seems to arise near the anal tube, and is long and slender, and a little curved.

Length $3\frac{1}{2}$-4 mill.

Hab. Queensland, Cairns (July-Aug.), Bundaberg (Sept.-Dec.), Kuranda (Aug.).

3. *hamadryas* sp. nov.

Head formed as in *dryas*, but colour different and instead of the large dark median nodule, there are 2 non-contiguous, much smaller, pale ones. It is a rather hairier species. Pale greenish, a thin black line on either side of the median keel of the vertex apically. Antennae pale green, annulated with black. Tegmina hyaline, the smoky pattern much as in *dryas*, but very faint; a few scattered darker specks on the apical third. Legs pale testaceous.

Female: genital segment testaceous.

Length $4\frac{1}{4}$ mill.

Hab. Queensland, Cairns (Aug.).

Anectopia, gen. nov.

Closely allied to *Eurysa* Fieber, but the veins of the tegmina in the long-winged form are more complicated apically and the bracial is forked apically.

Head dorsally transverse, not extending apically beyond the eyes; vertex transverse, its two compartments each having a puncture in the middle. Frons broad, median keel almost abso-

lete (*mandane*) or clearer (*igerna*). Antennae scarcely reaching to apical margin of frons, second segment about twice as long as the short first. Pronotum shorter and a little wider than the head, lateral keels turning more or less outwards; there is a puncture on each side of the middle keel. Tibial spur broad at base, foliaceous, with about 40 small, closely-set teeth.

1. *mandane* sp. nov.

Pl. XI, figs. 11-13 and 17; Pl. XIV, figs. 4-6.

Long-winged form. Vertex, genae, pronotum, antennae, legs, etc., more or less dark testaceous; frons and clypeus dark fuscous ,the former gradually deepening to black towards the apex. Sterna, scutellum and abdomen, very dark fuscous or blackish, except the base of the abdomen above (as also most of the metanotum) and abdomen below partly, orange sanguineous. Tegmina hyaline, second apical vein suffusedly, and 5th and 6th (and apex of 4th) apical cells, fuscous; tegminal veins pale, feebly granulate.

Short-winged female. Ovoid, the whole surface shining. Vertex, antennae, frons, pronotum, scutellum, sterna, legs, etc., testaceous more or less tinged with fuscous. Tegmina more or less dark fuscous, subopaque, a little paler internally. Abdomen blackish and fuscotestaceous. Tegmina somewhat convex, not quite reaching so far as the base of the genital segment, apically rounded.

Short-winged male like the long-winged form of the same sex, but the frons paler fuscous; tegmina subopaque, pitchy, not reaching to the apex of the abdomen.

Male pygophor, lip produced suberectly, margin doubly notched close to that point. Genital styles broad at the base, narrowing apically, the apex being acute. The oedeagus is horizontal, projecting between the blunt ventral projections of the anal tube.

Length male, female (macr.) 4, male (brach.) 2 mill.

Hab: Queensland, Cairns (July-Aug.,), Kuranda (Aug.).

2. *igerna* sp. nov.

Dark fuscous or blackish-brown; frons a little paler. Antennae fusco-testaceous; legs testaceous.

Similar to the genotype, but the frontal keel is distinctly more pronounced, though the frons is still highly polished, and the tegmina are much shorter and less convex.

Length 1⅝ mill.

Hab: Queensland, Bundaberg.

Only a single female unfortunately.

Haplodelphax gen. nov.

Allied to *Megamelus*; characterized by the structure of the vertex and by the radial vein not being forked.

Head dorsally longer than wide, produced in front of the eyes, apically rounded, the lateral and anterolateral keels being just interior to the apparent margins; within this is a keeled triangle, the acute anterior angle touching the anterior margin of the head; there is also a median keel which forks a little anterior of the middle, the short branches meeting the sides of the triangle a little anterior of its middle. Frons nearly twice as long as wide, lateral margins gently rounded; there is a strong median keel which meets the base without forking; apical margin angulate; basally a little of the vertex is visible laterally. Antennae short, subcylindric, not reaching apex of clypeus, second segment about twice as long as the first. Genae triangular, the apex blunt, that is to say, the median keels do not touch the lateral keels of the frons apically. Clypeus tricarinate. Pronotum tricarinate, lateral keels fairly straight, diverging posteriorly, usually not quite reaching the posterior margin. Scutellum tricarinate. Dimorphic as regards the tegmina; with the brachial vein in the long-winged form, forking close to the subapical line, the radial not forked; there are 6 apical cells, the first small ,sometimes divided. Tibiae apically with 5 spines of irregular size; spur of usual form, with 10 spines. First segment of hind tarsi longer than second and third together.

There are two species, of which I have seen only females. *H. iuncicola* is the genotype. The brachypterous forms may be separated as follows:

1 Tergites yellowish, faintly marked with pale brown..... ..... 1 *iuncicola*

1a Tergites brownish, marked with black and yellowish. 2 *naias*

1b Tergites immaculate yellowish.....3 *euronotianus*

1. *iuncicola* sp. nov.

Pl. XII, figs. 8-9.

Brownish testaceous, frons with scattered yellower specks. Tegmina hyaline, veins brownish or pale yellowish; wing veins dark brown. Tergites yellowish, obscurely spotted submedianly, in a row, with pale brown, in the short-winged form; in the macropterous form, the tergites are more or less suffused with blackish-brown. Tegmina not granulate, not piliferous.

Female ovipositor black.

Length: $3\frac{1}{2}$ (macropterous), $2\frac{3}{8}$ mill (brachypterous).

Hab: Queensland, Childers (Koebele's No. 2264 in part, on *Juncus*) Bundaberg (Sept.-Dec.).

2. *naias* sp. nov.

The *brachypterous females* differ from those of the genotype, by being darker. The tergites are brown with a very narrow yellowish median line; there is a submedian and a lateral stripe on each segment, both being narrow and black, and the former is bordered internally by a narrow yellowish stripe, and externally on the apical three tergites by a similar one, etc.

Length: 3 mill.

Hab: Sydney, New South Wales (Jan., K.).

3. *euronotianus* sp. nov.

Separable from *H. naias* by the smaller size, paler colour and longer vertex.

Pale yellow, immaculate. Eyes grey-black. Head dorsally one-half longer than wide between the eyes (in *naias* it is only between $\frac{1}{3}$ and $\frac{1}{4}$).

Female ovipositor sheath greyish fuscous.

Length 3 mill (brach.)

Hab: New South Wales, Sydney (Feb., K.).

I have seen females only.

Gelastodelphax.

1. *histrionicus.*

Pl. XVI, figs. 1-3 and Pl. XVIII fig. 16.

The male pygophor is very remarkable. The lip is strongly produced on each side, and there are two smaller projections

between these. The genital styles are elongate and bent at the apex. The oedeagus is horizontal and is subcultrate with, apparently, a long projection from one side.

Smicrotatodelphax.

1. *perkinsi.*

Pl. XVI, figs. 14-15 and Pl. XVIII fig. 14.

The male pygophor is roundly angular at the lip, and curvedly produced in a somewhat hollow manner dorsally at the sides. The genital styles bear some little resemblance to those of *Perkinsiella saccharicida,* but are more attenuated at the base and thickened inwardly there.

Megamelus.

I have temporarily retained this group as distinct from *Delphacodes.* The species included have the head distinctly produced before the eyes, the junction of the frontal keels almost on the top of the head, the pronotal keels not turning upwards, the first segment of the hind tarsi longer than the other two together. They have a common facies of a broad median longitudinal pale stripe, and dark lateral margins.

It seems to be a generic character that the ventral margin of the male pygophor is deeply emarginate 3 or 4 times; it is so at least in *M. notula, persephone* and *proserpina.*

1. *proserpina* sp. nov.

Pl. X, figs. 5-7 and Pl. XII, figs. 19-21.

Blackish fuscous with a broad, pale, ivory white band from apex of vertex to apex of abdomen, usually interrupted broadly on the middle of the abdomen, the pale colour of the abdomen is also rather yellower. Frontal keels paler fuscous. Sterna and sternites largely blackish fuscous; labium, antennae and legs pale, the antennae tinged with brownish; fore tarsi and first segment of hind tarsi blackish fuscous. Tegmina subhyaline, blackish fuscous, paler internally and exteriorly, greater part of commissure ivory white. Wing veins blackish fuscous. Antennal segments subequal. Tegminal veins not or scarcely granulate.

Male: the anal tube has two strong spines proceeding from the ventral wall in the middle; the pygophor is deeply quadriemarginate on the ventral margin. Genital styles broad at the base, tapering and curving towards the apex; oedeagus rather small.

Length 4 mill.

Hab: Fiji, Suva (Mar., K.).

persephone sp. nov.

Pl. XIV, figs. 7-9.

This is scarcely separable except by the genitalia, from *proserpina*, but whereas all the specimens of the former I have seen are macropterous, the present species is known to me only in its brachypterous form. The tegmina extend to about half the length of the abdomen; truncate apically, slightly obliquely.

The *male* pygophor is 5 times emarginate apically, the central production being emarginate to allow the egress of the elongate oedeagus, which is widely bifid basally, the projections being slender and acute. The anal spines are not very dissimilar to those in *proserpina*, but are longer and more divergent apically. The genital styles are somewhat like those of *proserpina*.

Length: $2\frac{7}{8}$ mill.

Hab: Queensland, Cairns (July-Aug.).

3. *sponsa* sp. nov.

Pl. X, figs. 8-9.

Pale ferruginous, a broad ivory white stripe from apex of head (dorsally) to apex of abdomen. Beneath pale ferruginotestaceous, legs testaceous, frons medianly rather broadly ivory white. Tegmina subhyaline, tinged with yellowish, subcosta and commissure, ivory whitish. Head slightly produced in front of eyes. Antennae reaching well beyond base of clypeus, first segment nearly as long as the second. Tegmina reaching a little beyond apex of abdomen, but membrane scarcely formed.

Length $3\frac{1}{3}$ mill.

Hab. Queensland, Cairns (July).

I have seen only brachypterous females.

"Delphax"

Kelisia Fieber, l. c. type *guttula* (Germ.)
Chloriona, Fieber, l. c. type *unicolor* (H.-S.)
Delphax Fieber, op. c., 520, (nec Fabr.)
Delphacinus Fieber, l. c. type *mesomelas* (Boh.)
Delphacodes Fieber, op. c., 524 type *mulsanti* Fieb.
Liburnia auctt. nec Stal.
Chlorionidea Loew 1885 Verh. Zool. bot. Ges. Wien XXXV 356 type *flava* Loew.
Delphax Fieber, op. c., 520 (nec Fabr.)
Delphacissa Kirkaldy 1906 Entom, type *uncinata.*
Sogata Distant 1906 Faun. Ind. Rhynch. III, 465, type *dohertyi* Dist.
Nilaparvata Distant l. c. type *greeni* Dist.

The above citation does not mean that I consider all these groups to form one genus, but simply that I cannot yet arrange the Australian and Fijian species under them, on the characters proposed for them. One difficulty lies in the large proportion of forms known only in a brachypterous state. Then again I place little reliance on many trusted characters.

Distant has used the length of the head, both dorsally and ventrally, as a principal character; this I cannot admit. The fact that the head is longer than wide dorsally as opposed to not longer than wide, if unaccompanied by other strong characters, is to me of no generic value. The same, in perhaps a rather less degree, with the frons, and also in this case as regards the contour. The comparative length of the cylindric antennae is also, within certain limits, not I think, of generic value.

Great stress is laid on the lateral keels of the pronotum, except by Distant, who disregards them. This seems to me a somewhat variable character and in any case a very difficult one to appreciate. In a few forms these keels are no doubt sharply separable into two categories, viz: (1) those which are straight, scarcely divergent posteriorly and reach the posterior margin of the pronotum, and (2) those which curve under the eyes and never reach the posterior margin. There are a large number of forms however which are intermediate, which proceed straightly in fact but fork not far from the posterior margin and proceed obscurely in two directions, under the eyes and obscurely to the posterior margin. There are also intermediate

forms between the two. Moreover in forms in which these keels curve under the eyes in long-winged forms, there seems to be a tendency towards a straightening of the keels in the short-winged forms. The venation is of comparatively small value. The relative proportion of the first segment of the hind tarsi to the other two together is used as a character of high importance by many authors, but I cannot so regard it.

The characters which appear to me to be of generic value in this section, lie in the genitalia and the tibial spurs, though I am not prepared, without the examination of a large series of European and American forms, to formulate genera based on them. ,

I have therefore thought it best to include all the Australo-Fijian species belonging to these "genera", in '*Delphax*', thereby obviating future synonymic difficulties, as *Delphax* is a synonym and has no generic value. It should be noted also that '*Liburnia*' often used for *Delphacodes*, is a strict synonym of *Embolophpora*.

The Australo-Fijian species of this complex are disposed artificially as follows:

1 Head, pronotum and scutellum fuscous or black with a more or less sharply contrasted pale longitudinal stripe..(2)
1a Head, &c., without such a stripe.....(7)
2 Ground colour of head, pronotum and scutellum flavo-fuscous ..... (3)
2a The same blackish-brown.....(6)
3 Long-winged forms: tegmina with internal half of membrane smoky .....(4)
3a Short-winged forms.....(5)
4 Narrower and longer, keels more pronounced..13 *geranor*
4a Broader and stouter, keels less pronounced....12 *kolophon*
5 Tegmina dark apically, with separate round black spot at apex.....14 *kaha*
5a Tegmina dark apically, without separate round black spot. ..... 15 *leimonias*
6 Long-winged form: tegmina more or less hyaline:
A. Head dorsally not longer than wide.....16 *anemonias*
AA. Head dorsally distinctly longer than wide.22 *eupompe*
6a Short-winged form: tegmina dark, with a narrow white border.....17 *pylaon*
7 Frons yellowish, pale fuscous, or subsanguineous, practically concolorous.....(8)

7a Frons with the lateral keels paler than the ground colour. ..... (11)
8 Frons dull yellowish or testaceous..... (9)
8a Frons shining, fuscous or subsanguineous..... (10)
9 Hind margin of pronotum widely angulately emarginate. ..... 3 *parysatis*
9a Hind margin truncate..... 2 *ordovix*
10 Middle keel on face, especially on clypeus, paler than the ground colour..... 9 *hyas*
10a Middle keel concolorous with the disk..... 10 *disonymos*
11 Ground colour of frons pale yellow..... (12)
11a Ground colour dark yellow..... (15)
12 Tegmina blackish..... 8 *matanitu*
12a Tegmina yellowish hyaline..... (13)
13 Head dorsally longer than wide..... 11 *ochrias*
13a Head dorsally not longer than wide..... (14)
14 Male: pygophor blackish..... 7 *lazulis*
14a Male: pygophor yellowish..... 6 *dryope*
15 Head distinctly produced in front of the eyes..... (16)
15a Head not, or scarcely, produced in front of the eyes... (18)
16 Tegmina dark fuscous, whitish opaque apically..... 5 *albotristriatus*
16a Tegmina hyaline or cinereous or fuscous, immaculate.. (17)
17 Frons long and narrow, lightly and gradually narrowing basally; lateral keels of pronotum not curved under the eyes, but reaching posterior margin of pronotum. 4 *ostorius*
17a Lateral margins of frons slightly sinuate, a trifle broader apically than basally; lateral keels of pronotum curving outward, not reaching posterior margin of pronotum..... 1 *thyestes*
18 Long-winged forms..... (19)
18a Short-winged forms..... (20)
19 Scutellum black..... 19 *astyanax*
19a Scutellum with the hind angle white..... 18 *puella*
20 Apical margin of tegmen very narrowly white..... (21)
20a Apical margin not continuously white..... 20 *algebra*
20b Apical margin rather broadly white..... 17 *astyanax*
21 Tegmina deep fuscous..... 21 *dilpa*
21a Tegmina pale, partly smoky..... 18 *puella*

1. *thyestes* sp. nov.

Pl. X, figs. 12-13.

Fuscous or blackish-brown, head and keels yellowish fuscous. Antennae and legs fuscous. Pronotum and scutellum dirty yellowish-grey, middle keel and posterolateral margins of the latter sometimes very narrowly pale, two obscure pale longitudinal stripes.

Head dorsally longer than wide, produced a little in front of the eyes, vertex with a keel down the middle. Frons a little broader apically than basally, keels distinct but filiform. Antennae reaching beyond the base of the clypeus, segments nearly subequal in length. Pronotum with lateral keels fairly straight but very divergent, not reaching the hind margin, but continuing parallel with it in the form of 2 or 3 granules, hind margin very obtuse-angularly emarginate. Tibial spur with about 16 well developed spines, first segment of hind tarsi longer than the other two.

Long-winged form: Scutellum about twice as long as pronotum. Tegmina hyaline cinereous, with 7 apical cells, generally unforked (this varying in the same individual), veins feebly granulate, pale yellowish fuscous.

Short-winged form: Scutellum shorter than pronotum. Tegmina reaching to about one-half of the length of the body, hyaline cinereous, apical margin subcrescentiformly pale with a dark fuscous spot (this may be obscurely marked); not quite contiguous apically, apical margin subtruncate, a little rounded.

Length 3 (brach.)-4⅛ (macr.) mill.

Hab. Queensland: Bundaberg (Nov.), Brisbane (June).

Only females have been seen.

This species does not fit into any described genus, being perhaps partly *Chloriona*, partly *Delphacissa*.

2. *ordovix* sp. nov.

This short-winged form is similar in appearance to that of *D. thyestes*, but the vertex is shorter and narrower, the frons yellowish fuscous, concolorous, polished and shining, parallelsided, the keels filiform and not prominent. First antennal segment about three-fourths the length of the second. Lateral keels of pronotum curved under the eyes. Tegmina apically rounded, shining, obscure yellowish fuscous, apex of clavus with a dark

spot. Tibial spur with about 30 minute spines; first segment of hind tarsi longer than the other two.

Length 3 mill

Hab. Queensland, Brisbane (June, No. 2264 in part.).

I have seen only one female.

This species is apparently a *Delphacodes*.

3. *parysatis* sp, nov.

Pl. X, figs. 10-11.

Allied to the last, but the legs, &c., are testaceous, and the pleura are not noticeably marked or spotted. Head dorsally scarcely as long as broad. Pronotal keels as in *thyestes*. Tibiae and tarsi as in *ordovix*.

Long-winged form: tegmina hyaline tinged with yellow, apical veins infuscate and a small dark lanceolate spot near the apex of the clavus. Scutellum about two and a half times as long as the pronotum which is obtuse-angularly emarginate.

Short-winged form: allied to that of *ordovix* but the legs &c., are testaceous, and the pleura are not noticeably spotted or marked. Pronotum about as long as scutellum.

Length (Macr.) $4\frac{3}{4}$, (brach.) $3\frac{1}{2}$ mill.

Hab. Queensland, Cairns (Aug.).

Only females, unfortunately, of this species which is more or less a *Delphacodes*.

4. *ostorius* sp. nov.

Pl. XVI, figs. 10-11.

Head dorsally longer than broad. Vertex with a keel down the middle. Scutellum about twice as long as pronotum. Tibiai spur with about 23 spines, hind tarsi as in the last.

Long-winged male: Dark fuscous or blackish brown, with pale keels, legs, etc. Tegmina dark fuscous, subhyaline, immaculate, with 7 apical cells, the third apical vein being also forked, veins very feebly granulate.

Short-winged female: Similar in appearance to *D. thyestes*, but the frons is long and narrow, slightly and *gradually* narrowing basally. Lateral keels of pronotum not curved under the eyes, but reaching posterior margin of pronotum. Tegmina immaculate, apically broadly rounded, reaching to about one-half of

the entire length of the insect. First antennal segment about one-half of the length of the second.

Male pygophor rounded at the end, the dorsal margin produced at each side, the produced part flattened and bent over at the end. The genital styles are compressed, the apices somewhat acute and bent.

Length 2¾ (brach.) 4 (macr.) mill.

Hab. Queensland, Cairns (Aug., 2264 in part).

5. *albotristriatus* sp. nov.

Pl. XX, figs. 15 and XIV, figs. 1-3.

Shortwinged form allied to *thyestes*.

Dark fuscous, or blackish, a little less dark on the vertex. Eyes castaneous or fuscocastaneous. Antennae, keels on frons and clypeus, legs, etc., fuscotestaceous. Pronotum (except ventrally), posterolateral margins of scutellum, subcostal vein, apical margin of tegmina broadly, last two or three tergites, etc., opaque whitish.

Keels all strong, even on the clypeus. Head dorsally longer than wide, produced a little in front; frons widening curvedly towards the apex but narrowing very slightly at the apical margin. Pronotal keels divergent, not curving under the eyes and not reaching the hind margin. Scutellum shorter than pronotum. Tegmina nearly square, extending to about half the length of the abdomen, subtruncate apically and contiguous along the commissure. Tibial spur with about 16 well developed spines, tarsi as in the last.

Male pygophor apically rotundate oval, the rim thickened about the anal third and produced there in a short spine. Genital styles broad, bifid apically.

Length 2¼ 2¾ mill.

Hab. Queensland, Brisbane and Bundaberg (Nov.).

I have seen males only.

6. *dryope* sp. nov.

Pl. XVI, figs. 12-13.

Somewhat like *D. osborni*.

Yellowish testaceous, frontal and clypeal keels whitish-yellow, the former very narrowly bordered internally with dark fuscous. (in the males the keels are less broad and less whitish). Pro-

notal keels whitish yellow, a dark fuscous spot on each side anteriorly. Scutellum medio-longitudinally pale with a pale brownish-yellow sinuate line on either side. Underneath pale testaceous, a fuscous spot on each mesopleuron. Tegmina hyaline, veins pale except the apical ones, which are fuscous. Lateral margin of frons subparallel, slightly narrowed basally, a little more so in the male than in the female, keels rather flattened. Antennae not reaching beyond base of clypeus, second segment nearly twice as long as the first. Pronotum as in *osborni*. Tibial spur with about 27 spines. Tegmina with 8 or 9 apical cells, the 4th, 7th being pedicellate.

Male pygophor pale yellowish: subrotundate viewed end-on, the lateral margins thickened and produced into a short spine near the anal tube Anal tube with a elongate, strong, downward directed tooth from its ventral wall on each side, and about 5 tiny spines between oedeagus subhorizontal, elongate. Genital styles divergent, apically bifid.

Female abdomen beneath more or less fuscous.

Length (brach.) 2½ (macr.) 4½ mill; both sexes are dimorphic.

Hab. Queensland, Cairns (Aug.) Redlynch (July) Kuranda (Aug.); Fiji, Rewa (Dec., Muir).

1. *lazulis* sp. nov.

Pl. XVIII, figs. 1-3.

I can distinguish this from the last described only by the rather smaller size, by the blackish pygophor in the male and different genitalia in that sex I think the females would be very hard to tell apart from those of *dryope*. I have seen only brachypterous forms.

Male pygophor blackish, subrotundate viewed end-on, the lateral margins somewhat sinuate; anal tube with a projection on each side, pointing downwards. Genital styles not unlike those of *dryope*, but the outer apical angle blunter.

Length 1⅞ mill.

Hab Queensland, Cairns (Aug.), Redlynch (July).

8. *matanitu* sp. nov.

Pl. XVI, figs. 4-5; & Pl. XVIII, fig. 15.

Pale brownish-yellow, or yellowish-testaceous, keels of frons slightly paler.

Tegmina black. Head dorsally scarcely extended before the eyes. Pronotal keels curvedly divergent. Spur with 15 or 16 spines.

Male: pygophor in profile greatly emarginate ventrally. Genital styles divergent, the apices truncate and thickened.

Length 2 mill. (brachypterous).

Hab. Viti Levu, Rewa (Dec., M.), Ba (Jan. ,M.), Navua (Feb., M.).

The vertical cross keels are obscure and are not shown on fig. 15 of Pl. XVIII.

9. *hyas*, sp. nov.

Somewhat like *dryope*, but the keels of the frons are only very slightly lighter than the pale ochraceous disk; antennae not reaching to base of clypeus. Tegmina hyaline, veins pale yellow, tending to pale fuscous on the membrane, granules pale fuscous. Spur with 22 spines.

Male: pale ochraceous; tergites broadly fuscous medio-transversely, orange basally. Sternites more or less dark fuscous partially, pygophor suffused with fuscous beneath.

Female: almost uniform, more or less pale ochraceous.

Length 3⅓ mill.

Hab. Queensland, Redlynch (July), Kuranda (Aug.).

10. *disonymos* sp. nov.

Pl. XVIII, fig. 4.

Allied to the last. Pale yellowish testaceous. Head very slightly produced before the eyes; lateral margins of frons subparallel, slightly narrowed basally,keels flattish. Antennae not reaching beyond base of clypeus. Lateral keels of pronotum curving outwards. Tegmina with 6 unforked apical cells. Spur with 16 spines.

Male: pygophor rounded, subtransverse viewed end on. The genital styles are elongate, gradually widening a little towards the apex, where they are truncate.

Length 3¾ mill.

Hab. Fiji, Rewa (male, Apr., M.), Suva (female Mar.,K.).

11. *ochrias* sp. nov.

Has the head form of *Chloriona*.

Ochraceous or testaceous. Sterna, legs, etc., paler, a narrow somewhat paler median line down the tergites (and in the macropterous form, the space between the lateral keels of pronotum and scutellum is paler). Antennae not reaching to apex of frons, first segment scarcely longer than wide.

Long-winged forms: veins feebly granulate.

Short-winged forms: tegmina narrowly rounded, reaching to about half the space between the tegulae and the apex of the abdomen.

Length 3½ (macr.), 2½ mill. (brach.).

Hab. New South Wales, Sydney (Jan., Koebele's No. 2232), Fiji (Mar., K.), Rewa (Mar., M.).

Koebele & Perkins collected one imperfect macropterous and 15 brachypterous adults and 3 nymphs, all females. The type is a macropterous female from Fiji, taken later by Muir.

To this species probably also belong some forms in which the ochraceous is replaced (as is sometimes the case in other ochraceous species) by orange-sanguineous or sanguineous.

Hab. Queensland, Bundaberg (Sept.-Nov.), Brisbane (June) Cairns (Aug.).

12. *kolophon* sp. nov.

Pl. XV, figs. 9-11.

Testaceous, somewhat paler on pronotum and scutellum medianly; frons, between lateral keels and central keel, sometimes pale fuscous. Pronotum and scutellum more or less fuscous exterior to the lateral keels.

Tegmina hyaline, veins pale; interior two-fifths smoky, the veins on this fuscous; subcostal vein smoky, commissure whitish. Antennae not reaching to apical margin of frons, second segment twice as long as the first.

Male. Tergites, including pygophor, dark fuscous or blackish-brown, a transverse yellowish-brown, or orange, sanguineous band near the base. Sterna and sternites mostly dark fuscous, the latter basally yellowish-brown, with a spot or two laterally. Pygophor subtrotundate, viewed end on, the outline sinuate. Anal tube with 2 elongate spines from the middle, directed downwards,

almost embracing the upwardly directed oedeagus. Genital styles broad basally, subconstricted just before their bifurcation, the forks being long and acute.

Female. Sterna and abdomen pale yellowish-orange; tegmina not so smoky as in the male. Pronotum and scutellum scarcely fuscous laterally.

Length 3 mill.

Hab. Queensland, Redlynch (July), Cairns (Aug.), Kuranda (Aug.).

The keels are not very prominent.

13. *geranor,* sp. nov.

Pl. XVI, fig. 3.

Superficially like *kolopohn,* but narrower and longer ,keels more pronounced, etc.; median longitudinal stripe from head to scutellum whiter. Frons intercarinally fuscous. The male genitalia are also very different.

Male: pygophor rather elongate viewed end-on, and thickened inwardly at the sides. The anal tube has a lateral spine on each side directed downwards and apparently 2 downwardly and outwardly directed spines between the above. Oedeagus of remarkable form (shown in the figure). Lip produced somewhat in the middle. Genital styles contiguous longitudinally at base, diverging their lateral margins angulate in the middle, apically truncate, the apical angles on each side being acute.

Length $3\frac{1}{3}$ mill.

Hab. Queensland, Cairns (July).

14. *kaha* sp. nov.

Pl. XVI, figs. 8-9.

Dark brownish-black, a whitish median stripe on head dorsally, pronotum and scutellum. Commissure basally the same. Frontal keels, antennae, legs, spots on pleurites, etc., yellowish testaceous. Tergites orange-yellow, more or less marked with fuscous, especially lateral. Spur with 15 teeth. Pronotum with lateral keels curvedly divergent.

Long-winged: tegmina milky hyaline and dark fuscous (as shown in figure).

Short-winged: tegmina fuscous, commissure whitish, a black spot on apical margin of tegmina.

Male: pygophor with sinuate outline. Lip produced. Anal tube without spines. Oedeagus with a curious angularly bent appendage. Genital styles rather small, obliquely truncate basally, nearly touching apically.

Length 3 (Mar.), 2 (brach.) mill.

Hab. Queensland, Kuranda (Aug.).

15. *leimonias* sp. nov.

Short-winged form: closely allied to the last, but tegmina dark fuscous subhyaline, apically opaque, margins ivory-white, broken in places by the dark tint. Median keel of frons and clypeus ivory-white. Tergites dark fuscous, medianly white.

Length 2⅔ mill.

Hab. Queensland, Cairns (Aug.).

I have only seen females.

16. *anemonias* sp. nov.

Pl. X, figs. 1-2 and Pl. XVI, figs. 1-2.

Dark brownish black. Head dorsally, pronotum and scutellum with a broad median, ivory-white stripe. Commissure and frontal clypeal keels narrowly, lateral and posterior margins of the ventral part of the pronotum, tegulae, etc., white. First segment of the antennae blackish brown, second dark fuscous. Lateral keels of pronotum and scutellum narrowly obscurely ferruginous. Tegmina hyaline, veins pale fuscous except the very pale subcosta, outer fork of radial, etc. Femora more or less dark fuscous, tibiae and tarsi testaceous. Pleurites bordered pallidly, more or less. Head not extending anteriorly in front of eyes. Lateral keels of pronotum curvedly divergent. Spur with 19 spines.

Male pygophor apically truncate in profile. Oedeagus horizontally projecting near the anal tube. Genital styles broadening towards the apex, which is truncate, inner margins irregularly sinuate.

Length 3 ⅓ mill.

Hab. Queensland, Redlynch (July), Cairns (July-Aug.), Kuranda (Aug.).

17. *D. pylaon* sp. nov.

Pl. XV, figs. 12-14.

Close to the last, but the lateral keels straightly divergent, and spur with 19 spines.

Long-winged form (male) tegmina much shorter. Ground color of pronotum and scutellum paler fuscous, lateral keels white; the mesosterna bordered exteriorly with white.

Short-winged form (female of same species?); blackish-brown, lateral keels of pronotum white. Tegmina subhyaline, dark fuscous, rather broadly (comparatively) bordered exteriorly from exterobasal angle to interobasal angle with ivery-white. Tergites with a median line of ivory white and a lateral and two sublateral, similar (but more broken up) lines.

Male pygophor triemarginate towards, and at the ventral margin. Genital styles widening out towards their apex, which is subtruncate, the angles rather rounded, the inner margins on the apical half, irregularly sinuate. Oedeagus arising close to the ventral wall of the anal tube and bending outwards and downwards a little over the genital styles. There are no spines on the anal tube ventrally.

Length $2\frac{1}{2}$ (macr.), $2\frac{1}{4}$ (brach.) mill.

Hab. Queensland, Cairns (July), Brisbane (June).

18. *puella*.

Pl. XV, figs. 1-3.

Liburnia puella Van Duzee; Forbes and Hart 1900 Bull. Illinois Agr. Sta. 60 p. 416. Pl. 1, f. 2.

Hab. Queensland, Cairns (Aug.), Redlynch (July); Fiji, Suva (Mar., K.).

Also from North America, New Jersey, New York, Iowa and Mississippi (Van Duzee), Ohio, Kentucky (Swezey), Illinois (Forbes & Hart), on grass, grains and sugar beet.

The basal segment of the antennae varies from testaceous to blackish. The middle keel of the frons in the Australasian individuals is usually blackish, though sometimes paler fuscous; the Americans are usually whitish. The spur has about 20 spines.

Male pygophor oval; anal tube cleft ventrally, with 2 diverging spines. Oedeagus a little swollen apically. Genital styles small and laterally arched, nearly meeting apically. This species is very close to *albicollis*, but is a little larger, the posterior angle

of the scutellum white, the frons is coloured differently and the male pygophor different. I am indebted to my friend Mr. Van Duzee for a pair of his *puella.* *

19. *astyanax* sp. nov.

Pl. X, fig. 20; Pl. XIV, figs. 13-15. **

Closely allied to *D. puella,* but smaller, the genae and scutellum entirely black, and the lateral margins of the frons more rounded laterally. In the short-winged form, the tegmina are subtruncate, and broadly margined with white apically. Spur with about 14 spines.

Male pygophor exceedingly remarkable. The anal tube is elevated and shaped somewhat like a square hood. The lateral margins of the pygophor close to the anal tube project acutely and somewhat curvedly. Genital styles truncate apically, the angles being acute and prominent. The oedeagus has a crown of 4 long spines (or is apically elongately quadrifid in other words).

Length about 1⅞ (brach.), 2¼ (macr.) mill.

Hab. New South Wales, Mittagong (Jan., K.).

20. *algebra* sp. nov.

Pl. X, figs. 16-17; Pl. XV, figs. 15-16.

Closely allied to *D. puella* but (in the short-winged forms at least) the tegmina are deeply fuscous and more opaque; basal half of commissure and a tiny spot near the apex internally whitish. The median keel of the frons is rather thick and whitish, and the lateral keels of the pronotum are straight and reach the hind margin. Spur with 33 spines.

Male pygophor suboval, broadly produced near the anal tube, which has 2 projections from the ventral wall. The genital styles are widened and truncate apically, the outer angles rounded, the inner acutely produced.

Length 1⅞ mill (brachypterous form only known).

Hab. Queensland, Kuranda (Aug.), Cairns (July-Aug.).

* Dr. Melichar kindly sent me some years ago a male of the Sinhalese *albicollis* Motschoulsky, the male pygophor of which is figured Pl. 14 figs. 10-12. It is subrotundate viewed end on and has a flat projection on each side near the anal tube, turning a little outwards and very conspicuous in profile. The anal tube has no spinose projections. The oedeagus is apparently short. Genital styles less arched than in *puella* and dilated apically, being shortly bifid, the angles acute.

** Pl. 10 f. 20 is not quite accurate, the lateral margins of the vertex should be more concave.

21. *dilpa,* gen. nov.

Pl. X, figs. 18-19; Pl. XVI, figs. 6-7.

Short-winged form similar to *algebra,* but the white apical margin of the tegmina is very narrow, and the male genitalia are very different.

Male pygophor suboval, margins sinuate. Oedeagus horizontal, elongate. Genital styles inwardly curved, the apices truncate, angles prominent and acute, or subacute.

Length 1½ mill.

Hab. New South Wales, Mittagong (Jan., K.).

The vertex in Pl. X, fig. 18 is a little too prominent.

22. *eupompe* sp. nov.

Pl. X, figs. 3-4; Pl. XII, figs. 16-18.

Superficially like a *Megamelus,* but the male pygophor is not of the *Megamelus*-type. Perhaps a *Kelisia.*

Dark fuscous or blackish; vertex, antennae, pronotum and scutellum, between the lateral keels, legs, commissure, yellowish-white.

Tegmina dark fuscous, first and second, and the outer part of 3rd and 4th, apical cells, a little paler. Veins closely but flatly granulate. Frons laterally acute and subreflexed, gradually narrowing towards the base; the central keel strong but rather flat; antennae short, first segment scarcely half the length of the short second. There are 9 apical cells, 4 and 7 being pedicellate. Tibial spur with 13 spines.

Male pygophor somewhat diamond-shaped, and is thickened internally at the middle laterally, anal tube with 2 median, strong, straight spines, between which arises the upward and outwardly directed oedeagus. The genital styles are divergent, elongate, acute, not bifid.

Length 3 mill.

Hab. New South Wales, Sydney (Jan.); Queensland, Cairns (Aug.), Bundaberg (Nov.); Fiji, Suva (Mar., K.).

The cross keels on the vertex in Pl. X, fig. 3 were inadvertently omitted.

Derbidae.

This family contains the most delicate and remarkable forms of the Fulgoroidea, or even of the Auchenorhynchi. While such forms as *Nisia* and *Philadelphcia* seem to have little in common, there are numerous intermediate forms which render sharp groupal separation difficult. There seem to be two main subfamilies, viz: (1) Nisiinae, represented by *Nisia* in which the last segment of the labium is comparatively elongate, and the anal vein of the clavus strongly granulate, and (2) Derbinae represented by *Philadelphcia*, in which the last segment of the labium is annuliform, generally a little wider apically than basally, and the anal vein not granulate, the latter division being much more numerous in genera and species. Unfortunately in the genera *Thyrocephalus, Basileocephalus* and *Phaciocephalus,* we have a small intermediate group in which the anal vein is granulate and the last segment of the labium annuliform.

In the following table of Australo-Fijian genera, I have endeavoured to include those recently described by Distant. As the latter mentions the shortness of the apical segment of the labium as a character of the (sub-) family in the Oriental forms, (he includes *Nisia* in which it is comparatively elongate!), I have supposed that his Australian genera have the same character.

1	Last segment of labium somewhat elongate, (anal vein and head granulate)	(2)
1a	Last segment of labium annuliform	(4)
2	Head strongly carinate along the middle	3 *Phaconeura*
2a	Head not medianly carinate	(3)
3	Lateral keels of frons parallel	1 *Nisia*
3a	Lateral keels of frons narrowing basally as seen from below	2 *Suva*
4	Anal vein of tegmen granulate (*)	(5)
4a	Anal vein simple (*)	(7)
5	Pronotum more or less normal; vertex anteriorly truncate	6 *Thyrocephalus*
5a	Pronotum laterally laminate, sinuate, recurved, partly enclosing antennae; vertex not truncate anteriorly	(6)

(*) Distant has not mentioned in any of his descriptions a most important character, viz.: The granulation of the claval veins and of the head, etc., so that I have arranged his genera under the second division, except *Urabunna*, in which his artist seems to have recognized the importance of the claval granulation, and which is only a synonym of *Basileocephalus*.

6 Lateral keels of frons continuing acutely to apical margin ..... 4 *Basileocephalus*

6a Lateral keels of frons flattening out apically ..... 5 *Phaciocephalus*

7 Antennae not projecting beyond the anterior margin of the head (in profile or dorsally) .....(8)

7a Antennae projecting beyond the anterior margin of the head ..... (23)

8 Antennae scarcely more than twice as long as wide....(9)

8a Antennae more than three times as long as wide.....(20)

9 Wings developed ..... (10)

9a Wings rudimentary ..... 19 *Muiria*

10 Head narrower than pronotum .....(11)

10a Head wider than pronotum.....18 *Philadelphia*

11 Subcostal vein of tegmen simple .....(12)

11a Subcostal vein of tegmen granulate .....17 *Nesoniphas*

12 Tegmina broader and less elongate, or if elongate then strongly widening apically; wings longer in proportion ..... (13)

12a Tegmina narrow and elongate; wings much shorter.... ..... 16 *Proutista*

13 Vertex transverse, apically truncate, separated from frons by a transverse keel, scarcely extending before the eyes ..... 7 *Lamenia*

13a Vertex more or less elongate, distinctly not transverse. (14)

14 Vertex elongate, apically truncate, tegmina widening very strongly towards the apex .....15 *Lyricen*

14a Vertex with lateral margins acute and parallel, not separated from the frons by a cross keel.....8 *Rhotana*

14b Vertex elongate, angulate, extending in front of the eyes ..... (15)

15 Antennae not (or very feebly) tuberculate .....(16)

15a Antennae subrotundate, strongly tuberculate.....13 *Kaha*

16 Head sublinearly elongate as seen dorsally, more than four times as long as an eye.....14 *Vivaha*

16a Head not as above .....(17)

17 Lateral margins of vertex narrowly (or not) reflexed, closer at base, feebly sensorized .....(18)

17a Lateral margins of vertex more reflexed, well separated at base, usually strongly sensorized .....(19)

18 Antennae short .....9 *Levu*

18a Antennae elongate, flattened and compressed, elongate-oval in profile ..... 10 *Niphadodite*

19 Genae simple ..... 11 *Pyrrhoneura*

19a Genae with a small subrotundate, laminate appendage.... ..... 12 *Nesocore*

20 Antennae, subcylidric, granulations feeble....20 *Heronax*

20a Antennae more or less flattened, with very conspicuous granulations ..... (21)

21 Head not longer than the nota, lateral margins of vertex not sinuate .....21 *Nesophantasma*

21a Head longer than the nota, lateral margins of vertex sinuate ..... (22)

22 Head in profile only slightly ascendant, only slightly sinuate, broad ..... 22 *Phantasmatocera*

22a Head in profile curved and recurved, subascendant, narrow ..... 23 *Swezeyia*

23 Wings very little shorter than the tegmina, vertex elongate ..... 24 *Kuranda*

23a Tegmina twice as long as the wings, head comparatively short ..... (24)

24 Antennae cylindric; tegmina subparallel, apically subobliquely truncate .....25 *Zoraida*

24a* Second segment of antennae deeply constricted near the apex (*); tegmina widening at the middle, apically subangulately rounded .....26 *Sikaiana*

Nisia.

1. *atrovenosus.*

Add: Fiji, Rewa (March-Apr., M.), Ba (Jan., M.), Navua (Feb., M.). Melichar has also recorded it from Abyssinia, Haro-Bussar (1904 Verh. Zool. bot. Ges. Wien LIV 34) and Distant from the Indian mainland (Faun. Ind. Rh. III, 309, fig. 150).

Suva.

The tegminal venation is very similar to that of *Nisia,* but there are two obliquely transverse veins in the subcostal cell (in the apical half), the median apical vein is forked (though this would probably vary in a long series, as it does in *Nisia*), and the lower apical part of the tegmen is more venose, more as in *Kermesia.* The head is depicted on Pl. IX, figs. 14-16.

* Distant erroneously treats this as two segments.

Basileocephalus.

Basileocephalus Kirkaldy.
=*Urabunna* Distant 1907, op. c., 414.

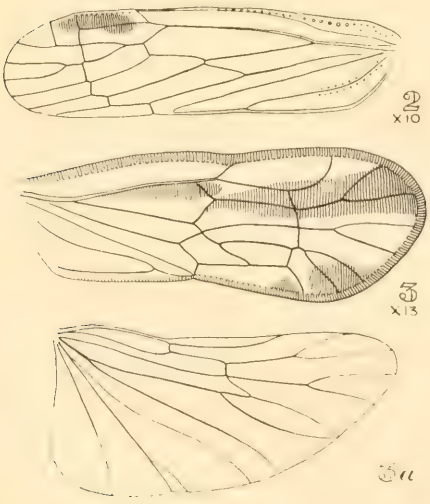
The care with which Mr. Distant has really studied my descriptions, is shown by his appreciation of my genus *Basileocephalus.* Although I specially remarked on the curious laminate recurved lateral margins of the pronotum, Mr. Distant supposes that this genus is closely allied to his *Sikaiana,* in which the pronotum bears no conceivable resemblance to such a description, while the latter fits that of his *Urabunna.* Mr. Distant has neglected to notice the sensory organs on the vertex and the granulated anal vein of the clavus, though the latter character has been noticed and included by his acute artist.

1. *thaumatonotus.*

Pl. IX, figs. 9-11, and Pl. XIX, fig. 20.

B. thaumatonotus Kirkaldy.
=*U. lineata* Distant, l. c., fig. 7.

I imagine Distant's species to be a synonym of the above, but he does not mention that the tegminal veins are noticeably coral-red.



Phaciocephalus.

I inadvertently placed this genus among those with the last segment of the labium fairly long; it is, however, subannuliform.

The venation of the tegmen and wing is shown in the text figure attached (No. 3).

The six species, all Fijian, are separable as follows:

1 Tegmina with red or orange markings.....(2)
1a Tegmina not marked with red or orange.....(3)
2 Inner half of tegmen reddish with 2 long yellowish spots on the margin; tegmen not at all smoky.....4 *miltodias*
2a Inner half of tegmen reddish, the inner margin creamy (sometimes interrupted by the ground colour close to the apex of the clavus), this inner half largely smoky, especially apically .....3 *nesodreptias*
3 Tegmen creamy with a greyish brown longitudinal stripe (4)
3a Tegmina whitish with the veins greyish-black and broadly marked ..... 6 *minyrias*
3b Tegmina pitchy, subcostal cell yellowish white..... *pullatus*
4 Tegmen with the greyish black stripe not connected with the commisure by a dark cross-streak.....1 *vitiensis*
4a Tegmen with the dark stripe connected with the commisure by a dark cross streak ..... *nesogonias*

1. *vitiensis.*

Pl. XIX, figs. 12-14.*

Mr. Muir has taken specimens (measuring up to 6 mill. long) in Fiji, Suva (No. 110), arboreal.

2. *nesogonias*, sp. nov.

Head and pronotum creamy, a little darker laterally. Scutellum dark blackish-brown, sometimes paler medianly. Tegmina milky, a broad, blackish-brown stripe down the tegmen, forking close to the base, also broadly touching the sutural margin at the middle and at the apical part. Wings milky, veins dark. Legs pale, apices of segments blackish.

Length 5 mill.

Hab. Fiji, Rewa, (Mar., Apr., Nov., Muir).

3. *nesodreptias* sp. nov.

Head and middle fourth (longitudinally) of pronotum, legs, sternites, &c., yellowish white, sterna tinged with orange. Rest of pronotum and the scutellum orange-red. Tegmina yellowish-

* On Pl. 19 f. 12, the sublateral keels of the vertex are not clearly shown.

white, with an orange-red stripe much as in *P. nesogonias,* the veins on this part being blood-red.

Length 5 mill.

Hab. Fiji, Rewa (Mar. & Nov., Muir).

Var: The orange on the tegmina narrower and bordered exteriorly with smoky, or almost replaced by it. Pronotum with two blackish-brown spots and scutellum with two to four anterolaterally. The orange hue may be crimson.

4. *miltodias* sp. nov.

Pl. XIX, fig. 20.

Whitish yellow, pronotum laterally, scutellum (except sometimes medianly), orange-sanguineous. Pattern of tegmina as in *P. nesogonias,* but the colouring different, the blackish being replaced by orange sanguineous. Legs yellowish-white, apices very narrowly dark.

Length 4-4½ mill.

Hab. Fiji, Rewa (Mar. & Apr., Muir No. 137), arboreal.

The sulcate median part of the vertex is not shown.

5. *pullatus* sp. nov.

Head and pronotum brownish-yellow; vertex sordid, lateral margins very narrowly dark fuscous. Scutellum piceous. Tegmina piceofuscous, basally opaque, subcostal cell (except basally) yellowish, apical margin very narrowly sanguineous. Wings smoky hyaline, veins dark. Forelegs dark fuscous, the others brownish-yellow.

Length 6 mill.

Hab. Fiji, Rewa (Mar. Muir's Nos. 128 and 132), aboreal.

6. *minyrias* sp. nov.

Head pale fuscous of various tints, pronotum whitish; sterna and legs soiled whitish; scutellum orange fuscous, with 3 large brown wedges. Tegmina milky, the veins thickly blackish-brown, except the whitish basal two thirds of the subcostal cell.

Length 5½ mill.

Hab. Fiji, Rewa (Apr.).

Thyrocephalus.

1. *leucopterus.*

Pl. XVIII, fig. 8.

(See also text fig. 2 on p. 166).

Lamenia.

In my last memoir, I placed this doubtingly among the Cixiinae; it should however, I think, be placed here, although somewhat aberrant.

Rhotana.

I now add a Fijian species, which may be distinguished from the Australian forms as follows:

1	Veins of tegmina pale yellow (*)	1 *chrysonoe*
1a	Veins sanguineous	(2)
2	Tegmina largely dark smoky	3 *haematoneura*
2a	Tegmina hyaline	3 *halosydne*

3. *halosydne* sp. nov.

Similar in structure to the two previous species. Whitish testaceous. Eyes brownish. Tegmina hyaline testaceous, immaculate, veins on basal fourth pale, on the rest bright sanguineous. Wings hyaline, veins sanguineous.

Length 5⅛ mill.

Hab. Fiji,, Rewa (Apr.. M.).

* Since this was in proof, Distant has published descriptions of five species as new, all apparently allied to *chrysonoe*, but as the length of the head is not stated, they cannot be determined without seeing the types. They are as follows:

ramentosa p. 409, *transversa*, p. 410, *opalina*, p. 410, *septemmaculata* p. 410, and *quadrimaculata* p. 411.

Levu.

1. *vitiensis.*

Add: Fiji, Rewa (Mar., Apr., Dec., M.).

Niphadodite, gen. nov.

Allied to *Pyrrhoneura* but differs by the form of the antennae. Also somewhat similar to *Heronax,* but differs by the form of the antennae.

Lateral margins of vertex widely separated at the base, converging anteriorly, forming an acute angle. Frontal keels almost contiguous throughout, except just at their apices. *Clypeus basally wide,* extending laterally as far as, or farther than, the outside part of the antennal insertion. Antennae elongate, extending nearly as far as the head anteriorly, flattened and compressed, elongate oval in profile; head in profile extending anteriorly nearly twice as far as an eye's length. Tegmina not unlike those of *Heronax,* but obtuse-angularly produced beyond the clavus, somewhat as in *Lyricen.* Type *insulicola.*

1. *insulicola* sp. nov.

Yellowish-testaceous, paler beneath. Eyes greyish-black. Last segment of labium and the metanotum greyish fuscous. Tegmina subhyaline, yellowish testaceous, veins in part tinged with pale oranged. Apical cells partly faint smoky, and a few scattered fuscous spots on the rest of the tegmina. Labium reaching to about the middle of the abdomen.

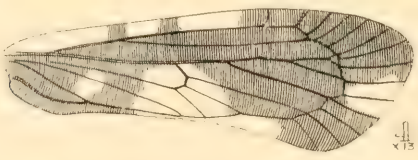
Length 7½ mill.

Hab. Viti Levu, (Mar. Muir's No. 130), arboreal.

Pyrrhoneura.

Pyrrhoneura Kirkaldy 1906.
Makula Distant, op c., 408.

1. *saccharicida.*



(fig. annexed, of tegmen, No. 4).

Add: Fiji, Rewa (Mar., Apr., Nov., Dec., Muir's No. 48) "common on certain native trees in the Bush and at times very common on Sugar Cane, turning the leaves yellow in streaks where they feed."

The stridulatory area is figured on Pl. XX, figs. 6-7.

2. *citharista* sp. nov.

The lateral margins of the vertex are rather more widely reflexed than in the type species. Testaceous, posterior angle of scutellum brown, genae partly suffusedly with rosy. Tegmina cinereotestaceous, veins concolorous, two transverse bands of grey-brown, at their base and on the basal third, the latter dividing into two at the radial vein, the lower branch (which is actually a spot on the subcostal cell) curving apical-wards and dividing into two bands which proceed irregularly to the apical parts of the tegmen. Wings hyaline, veins partly fuscous, a longitudinal fuscous stripe on the apical third near the middle.

Length 5 mill. to apex of closed tegmina.

Hab. Fiji, (March, Muir's No. 106,) arboreal.

The stridulatory area is figured on Pl. XX, figs. 1-2.

3. *ornata.*

Makula ornata Distant, l. c., fig. 5.

Hab. Queensland.

This differs from the preceding two species by having apparently a few more veins at the lower apical part, and usually in the Vitian forms, there is a cross vein in the first wing cell, but this is sometimes absent in *P. citharista.* The eyes are also a little farther from the dorsal margin of the genae in *P. ornata.*

Nesoneura subgenus nov.

Close to typical *Pyrrhoneura,* but the eyes are placed more as in *P. ornata* and the head in profile is subangulate anteriorly, while it is distinctly more elongate dorsally, being medianly extended farther in front of the eyes than with them.

4. *vitiensis* sp. nov.

Testaceous; the eyes and a small spot on each frontal keel at its base and the same at its apex, sides of pronotum narrowly, basal half of subcostal cell, blackish. Tegminal veins white, an ob-

lique, very obtusely angulate, band across the outer half of the apical half, part of the apical margin apical of the claval apex, and some obscure elongate spots more in the centre of the tegmen, fuscous.

Length 4¾ mill. to apex of closed tegmina.

Hab. Viti Levu, Rewa (Apr., M.).

Nesocorc, gen. nov.

Superficially somewhat like *Phaciocephalus* but the antennae are more elongate, obliquely subtruncate apically, and the lateral keels of the frons continue sharply to the apical margin.

From *Pyrrhoneura* it differs (as also from other genera) principally by the possession of what appears to be a small, subrotundate laminate appendix to the genae, on each side, roughly at right angles to the genae themselves.

1. *fidicina* sp. nov.

Testaceous; the vertex with a pink tinge, lateral margins of frontal keels dark at least basally; lateral margins of nota, the abdomen above basally, &c., pale fuscous. Genal lamina milky white. Tegmina hyaline, a pale fuscous streak along the interior half, a conspicuous blackish speck near the apex, apical margin narrowly dark, part of some of the veins near the apex sanguineous. Wings milky hyaline, some of the veins fuscous.

Length 6 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Muir's Nos. 151-4), under bark of an old tree much attacked by fungus.

Nymphs dark fuscous, the legs and sensory organs paler.

(Pl. XVIII, figs. 9-10).

Vivaha.

Vivaha Distant 1906 Faun. Ind. Rhynch. III 395, fig. 148.

1. *saniosa.*

V. saniosa Dist., 1907 A. M. N. H. (7) XIX 405.

Hab. Queensland.

Lyricen, gen. nov.

Vertex elongate, narrow, well produced in front of the eyes, posterior margin scarcely posterior to the anterior margin of the

eyes, apically narrowly truncate, longitudinally impressed, keeled medianly somewhat feebly; the head not impressed at the junction of vertex and frons and so separating them. Frons elongate, longitudinally impressed, basally constricted, apically truncate. Antennae short, subcylindric, subbifid apically, surrounded by a lobe of the pronotum. Pronotum deeply angulately emarginate in the middle; scutellum elongate, diamond-shaped. Tegmina elongate, apically ampliated and rounded.

1. *imthurni* sp. nov.

Pls. XIX, figs. 1-3 and Pl. XX, figs. 3-5.

Fuscous, grading to blackish in parts especially on the basal two-thirds of the scutellum; keels, foliaceous part of pronotum, &c., pale brownish-yellow. Scutellum with a yellowish line down the middle, broadening a little at the posterior angle. Legs testaceous, fore and middle femora faintly fuscous apically, hind femora faintly fuscous, annulated with testaceous; fore and middle tibiae fuscous apically. Abdomen dark fuscous, marked with sanguineous and testaceous. Tegmina cinereo-testaceous, veins concolorous, margined irregularly with fuscous, some of the apical cells mostly fuscous, apical margin very narrowly blood-red.

Length of body 4 mill., to apex of tegmina 9 mill., widest breadth of tegmen 5 mill., narrowest about 3 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Nov., M.).

The male genitalia are figured on Pl. XIX, figs. 1-3.

In accordance with a request from Mr. Muir, I name this interesting form after His Excellency Sir E. F. im Thurn, Governor of Fiji, a zealous naturalist and well known traveller, who afforded Mr. Muir great facilities and showed him much kindness during his researches in the Fiji Isles.

Proutista.

Proutista Kirkaldy 1906 Entom. XXXVII 279.

=||*Assamia* Buckton 1896 Ind. Mus. Notes W. p. 1.

=*Sardis* Kirkaldy 1906 Bull. Ent. H. S. P. A. I 426.

=*Phenice* Distant 1906 Fam. Ind., Rh. III 295 (not Westwood).

Distant cities *fritillaris* (Boh.) as the type of *Phenice*, but the true type is *fasciolata* (Boh.). I am aware that Westwood considered that the first species in a genus should as a rule be the

type, but he explicity stated that this was only the case when other reasons were absent (*). Now, *Derbe fritillaris* Boh. is the first species described, but *D. fasciolata* is figured and the *figures taken as the basis of the generic description.* I therefore maintain that *fasciolata* is the type of *Phenice* and it certainly not a *Phenice* in a Distantian sense.

1. *lumholtzi* Kirkaldy.

Pl. XIX, figs. 6-8.

Sardis maculosa Kirkaldy 1906 Pl. 28, figs. 4-6 (not *Phenice maculosa* Krueger)**

Proutista lumholtzi Kirkaldy 1907 A. S. E. Belg., LI, 126.

Head and pronotum testaceous, a speck at the base of the frons and another on the clypeus, and some suffusions apically on the pronotum, blackish brown. Mesonotum castaneous; a median keel, a rough W in the middle, and the hind margin medianly, testaceous. Metanotum dark, whitish medianly. Legs testaceous; fore coxae, apex of tibiae, &c., blackish. Abdomen testaceous and blackish confused. Tegmina hyaline, marked with blackish brown less closely than in *moesta.*

Length 7½, expanse of tegmina 15 mill.

Hab. Queensland, Cairns (Aug., P. & K.) on *Saccharum officinarum.*

The remarkable male genitalia are figured (Pl. XIX, figs. 6-8).

2. *australis.*

Phenice australis Distant, op. c., 397.

Hab. Queensland. Unknown to me.

Nesoniphas, gen. nov.

Vertex and pronotum raised and swollen vertically, the lateral margins of the vertex (as seen dorsally) rounded and apically produced linearly between and beyond the eyes which are very large. Frons linear, narrowly channelled medianly, widened and

* "I do not here insist upon the necessity of placing a typical species at the head of a genus.....but I do insist that where an author does not state the particular species which he regards as the type of his genus, we are bound to suppose that he would place it at the head of his genus." Westwood, April 1837 Mag. Nat. Hist. n. s., I, 170.

** Through the courtesy of Dr. Van Deventer, I have examined some Javanese examples of *Proutista moesta* (=*maculosa*), a species different from the Australian one. The stridulating area of *moesta* is figured on Pl. XX, figs. 8-9.

flattened apically. Antennae very short. In profile the head and pronotum are about equally raised but there is a deep cleft between the two down to their meeting place. Pronotum posteriorly emarginate in the middle, scutellum flat, not carinate.

1. *insignissima* sp. nov.

Pl. XIX, figs. 10-11.

Whitish testaceous, whiter above; frons margined with fuscous. Ocellus black. Eye dorsally with an interior black line which is continued on to the pronotum laterally. Tegmina milky hyaline, a dark fuscous line on the basal half of the subcostal vein; the tegmina also spotted elongately with greyish, veins white. Wings white, veins concolorous.

Length 5 mill.

Hab. Viti Levu, (Muir No. 55), Rewa Mar.-Dec.), on *Zingiber zerumbet* (wild ginger).

Philadelphia.

1. *pandani.*

The male genitalia are figured Pl. XIX, fig. 9.

Muiria gen. nov.

Distinguished from other *Derbidae* by the rudimentary wings. Head and pronotum vertical, vertex very small, triangular, and produced linearly anteriorly, projecting well beyond anterior margin of eyes, the latter being subcontiguous at about half their length. Frons linear, acute. Antennae elongate, first segment subannulate but prominent, second four times as long as maximum width, about equal in length to the fore femora, obliquely truncate apically, the flagellum arising at the short end of the truncation. Pronotum very narrow, deeply emarginate angularly. Scutellum rather feebly tricarinate.

1. *stridula* sp. nov.

Pl. XIX, f. 4-5 and Pl. XX, figs. 10-13.

Sanguineous; legs and genital segments (in part) paler; antennae testaceous. Tegmina hyaline, veins pale fuscous, costal and subcostal veins, apical margin, &c., sanguineous.

Length of body 2 mill., to apex to tegmen 5½ mill.

Hab. Viti Levu, Rewa (Mar., Muir's No. 159), off a low, native palm.

I have much pleasure in naming this remarkable genus after my friend Mr. Muir. His interesting remarks on the stridulation will be found on p. 7.

Pl. XX, fig. 13 does not depict the vertex quite accurately being too broad basally and not excavated. The scutellum of the mesonotum should be represented as feebly tricarinate.

Heronax Kirkaldy.

=*Fennahala* Distant, op. c., 412.

1. *parnassius.*

H. parnassius Kirkaldy.
F. infuscata Dist., l. c., fig. 6.

I think this synonymy is correct.

2. *rubrinervis.*

F. rubrinervis Dist., op. c., 413.
Hab. Queensland, Cairns.

3. *saccharivora.*

H. saccharivora Kirkaldy.

4. *juno.*

F. juno Dist., l. c.
Hab. Queensland, Kuranda.

This is evidently very close to *saccharivora*, but the colouring, as mentioned by Distant, seems a little different.

5. *pallescens.*

F. pallescens Dist., l. c.
Hab. Queensland.

Phantasmatocera.

Phantasmatocera Kirkaldy.
=*Arunta Distant,* op. c., 406.

1. *arborea.*

P. arborea Kirkaldy.
A. rubrovenosa Distant, l. c., fig. 3.

Distant has led himself astray by not noticing that it was not the generic type that was figured, but a second species, which in fact is not congeneric.

Nesophantasma gen. nov.

Differs from *Phantasmatocera* by the shorter head, whose lateral margins are only slightly sinuate, and by other structures well seen in the respective figures; by the shorter antennae which do not reach in profile to the apex of the eyes; the tegmina more rounded at the apex, and the apical areas larger and less in number. Type *vitiensis.*

1. *vitiensis.*

Phantasmatocera vitiensis Kirk., Pl. XXVIII, figs. 1-3.

Swezeyia.

1. *lyricen.*

Pl. XIX, figs. 15-19.

Mr. Muir has taken this in Viti Levu, Rewa (March).

Kuranda.

Kuranda Dist., op. c., 407.

1. *notata.*

K. notata Dist., l. c., fig. 4.
Hab. Queensland.
Not unlike *Niphadodite* except that the antennae are very different.

Zoraida.

||*Thracia* Westwood 1841 A. M. N. H., VI 478.
Zoraida Kirkaldy 1900 Entom., 242.

Distant has described five species as belonging to this genus, from Queensland, viz.:—

1 *cycnoptera* p. 401.
2 *eupoecila*, p. 402.
3 *consanguinea*, l. c.
4 *cydista*, l. c.
5 *picta*, p. 403.

Sikaiana.

Sikaiana Distant, op. c., 399.

1. *ocsiope* sp. nov.

Pl. XVIII, fig. 13 (tegmen).

Testaceous, eyes black. Antennae fuscous. Tegmina milky, two or three sanguineous specks on the costal margin, veins concolorous, very delicately marked with fuscous. Wings milky, veins concolorous, one or two fuscous specks.

Length 1½ mill to apex of body, 4¾ mill. to apex of tegmina.

Hab. Viti Levu, Rewa (Apr., Muir No. 167; 1 example in bad condition.

It seems close to *S. hyalinata* Dist. but it is smaller, the general hue of the venation is milky-white and the tegminal pattern is different. Distant has described two Australian species, *S. hyalinata* p. 399, fig. 1., and *S. maculosa*, l. c., Queensland.

DESCRIPTION OF PLATES.

Plate I.

1. *Cicadetta tympanistria.*
2. Male genitalia of the same, in profile.
3. Operculum of the same.
4. *Philagra parva,* wing, (a little diagrammatic).
5. *Polychactophyes serpulidia,* wing (do.).
6. *Dialectopteryx australica,* wing (the dotted lines show the restored parts).
7. The same, tegmen (do.).
8. *Astorga saccharicida,* nymph.
9. The same in profile.
10. *Muirella oxyomma,* nymph.
11. The same in profile.
12. Face of the same.
13. *Conosanus hospes,* nymph.
14. Long-winged adult of the same.
15. Short-winged adult.
16. Tegmen of long-winged form.
17. Tegmen of short-winged form.

Plate II.

1. *Idiocerus hylcorais,* vertex.
2. Face of the same.
3. *Nephotettix plebeius,* vertex &c.
4. Face of the same.
5. *N. curytus,* vertex &c.
6. Face of the same.
7. *Eurinoscopus lentiginosus,* vertex &c.
8. Face of the same.
9. *Driotura aristarche.*
10. Face of the same.
11. *Nephotettix apicalis,* tegmen.
13. Face of the same.
14. *Tharra* sp., nymph in profile.

15. Dorsal view of the same.
16. *T. nausikaa.*
17. Face of the same.
18. *Hybrasil brani,* vertex &c.
19. *Thymbris inachis,* female.
20. Face of the same.
21. *Muirella oxyomma.*
22. Face of the same.

Plate III.

1. *Siphanta acutipennis.*
2. *S. acuta.*
3. *S. toga.*
4. *S. acuta* (var.).

Plate IV.

1. *Siphanta sensilis.*
2. *S. granulicollis.*
3. *S. lucindae.*
4. *S. granulata.*

Plate V.

1. *Siphanta subgranulosa.*
2. *S. breviceps.*
3. *S. galeata.*
4. *Thanatochlamys tristis.*

Plate VI.

1. *Siphanta acutipennis,* vertex &c.
2. Face of the same.
3. *S. galeata,* vertex &c.
4. Face of the same.
5. *S. lucindae,* vertex &c.
6. Face of the same.
7. *S. granulicollis* (var.) vertex &c.
8. Face of the same.
9. *Thanatochlamys tristis,* vertex &c.
10. Face of the same.

11. *Siphanta granulicollis,* vertex &c.
(N. B.—The median keels are omitted).
12. *S. subgranulosa,* vertex &c.
13. *S. acuta,* the same.
14. Face of the same.
15. *S. sensilis,* vertex &c.
16. Face of the same.
17. *S. acuta,* last nymphal instar.
18. Face of the same.
19. The same in profile.
20. The same, egg-mass in situ.

Plate VII.

1. *Tylana acutipennis,* tegmen.
2. Vertex &c. of the same.
3. Face of the same.
4. *Phantiopsis australiaca.*
5. Vertex &c. of the same.
6. Face of the same.
7. Nymph of an unknown Fulgorine.
8. Face of the same.
9. *Apsadaropteryx elongatulus.*
10. Face of the same.
11. *Siphanta toga,* vertex &c.
12. *Chlamydopteryx ridicularius,* vertex &c.
13. Face of the same.
14. Tegmen of the same.
15. *C. vulturnus.*
16. Face of the same.
17. *Phaeopteryx sidnicus,* nymph.
18. Face of the same.
19. The same in profile.
20. The same, adult.
21. Face of the same.

Plate VIII.

1. *Leptochlamys compressa,* vertex &c.
2. Face of the same.
3. *Peltodictya kurandae*

4. Face of the same.
5. *Oliarus felis,* vertex &c.
6. Face of the same.
7. *O. lubra,* vertex &c.
8. Face of the same.
9. Tegmen of the same.
10. *O. phelia,* vertex &c.
11. Face of the same.
12. Tegmen of the same.
13. *Solonaima solonaima,* vertex &c.
14. Face of the same.
15. Tegmen of the same.
16. *Australoma austrina,* vertex &c.
17. Face of the same.
18. Tegmen of the same.
19. *Leirioessa tortricomorpha,* vertex &c.
20. Face of the same.
21. Tegmen of the same.

Plate IX.

1. *Aristyllis omphale,* vertex &c.
2. Face of the same.
3. *A. aristyllis,* vertex &c.
4. Face of the same.
5. *A. adippe,* vertex &c.
6. Face of the same.
7. *Eurynomeus australiae,* vertex &c.
8. Face of the same.
9. *Basileocephalus thaumatonotus,* vertex &c.
10. Face of the same.
11. The same in profile.
12. *Rhinodictya quaesitrix.*
13. Face of the same.
14. *Suva koebelei,* vertex &c.
15. Face of the same.
16. The same in profile.
17. *Callinesia pulchra.*
18. *Francesca saleminophila.*
19. Face of the same.
20. *Callichlamys muiri.*
21. Face of the same.

Plate X.

1. *Delphax anemonias,* vertex &c.
2. Face of the same.
3. *D. cupompe,* vertex &c.
4. Face of the same.
5. *Megamelus proserpina,* vertex &c.
6. Tegmen of the same.
7. Aberrantly veined tegmen of the same.
8. *M. sponsa,* vertex &c.
9. Face of the same.
10. *Delphax parysatis.*
11. Face of the same.
12. *D. thyestes.*
13. Face of the same.
14. *Peregrinus maidis.*
15. *D. albotristriatus.*
16. D. *algebra.*
17. Face of the same.
18. *D. dilpa* (N. B.—The vertex is too much produced).
19. Face of the same.
20. *D. astyanax.*

Plate XI.

1. *Stenocranus agamopsyche.* vertex &c.
2. Face of the same.
3. Face of the same, nymphal instar.
4. Nymph of the same.
5. *Perkinsiella saccharicida,* face.
6. Profile of the same.
7. Antenna of the same.
8. Hind tibial and tarsus of the same.
9. *Dicranotropis koebelei,* face.
10. Hind tibia and tarsus of the same.
11. *Anectopia mandane,* brachypterous form.
12. Face of the same.
13. Profile of the same.
14. *Dicranotropis pseudomaidis.*
15. Nymph of the same.
16. Face of the same.
17. *Anectopia mandane,* macropterous form.

18. Hind tibia and tarsus of *Tetigonia parthaon.*
19. The same of *Eurymelias hyacinthus.*
20. The same of *Philagra parva.*

Plate XII.

1. *Tropidocephala dryas,* vertex &c.
2. Face of the same.
3. The same in profile.
4. Hind leg of the same.
5. *T. eximius,* vertex &c.
6. Face of the same.
7. The same in profile.
8. *Haplodelphax iuncicola,* vertex &c.
9. Face of the same.
10. *Hadeodelphax pluto,* vertex &c.
11. Face of the same.
12. *Perkinsiella vastatrix,* male pygophor (end on).
13. The same (three-quarter view).
14. *P. sinensis,* the same (end on).
15. The same (three-quarter view).
16. *Delphax eupompe,* the same (end on).
17. The same (three-quarter view).
18. The same in profile.
19. *Megamelus proserpina,* the same (end on).
20. The same (three- quarter view).
21. The same in profile.

Plate XIII.

Male pygophors of Asiracidae, in two or three views.

1-3. *Perkinsiella pseudomaidis.*
4-6. *Dicranotropis muiri.*
7-8. *Peregrinus maidis.*
9-10. *Perkinsiella vitiensis.*
11-13. *P. saccharicida.*
14-5. *P. graminicida.*

Plate XIV.

The same as the preceding:

1-3. *Delphax albotristriatus.*
4-6. *Anectopia mandane.*

7-9. *Megamelus persephone.*
10-12. *Delphax albicollis.*
13-15. *D. astyanax.*

Plate XV.

The same as the preceding:

1-3. *Delphax puella.*
4-5. *Stenocranus pacificus.*
6-8. *Purohita arundinacea.*
9-11. *Delphax kolophon.*
12-14. *D. pylaon.*
15-16. *D. algebra.*

Plate XVI.

The same as the preceding:

1-2. *Delphax anemonias.*
3. *D. geranor.*
4-5. *D. matanitu.*
6-7. *D. dilpa.*
8-9. *D. kaha.*
10-11. *D. ostorius.*
12-13. *D.dryope.*
14-15. *Smicrotatodelphax perkinsi.*

Plate XVII.

Of the same nature as the preceding.

1-3. *Gelastodelphax histrionicus.*
4-5. *Tropidocephala dryas.*
6-7. *Stenocranus agamopsyche.*
8-9. *Dicranotropis koebelei.*
10-11. *Hadeodelphax persephone.*
12. *H. pluto.*
13-14. *Melanesia pacifica.*
15-6. *Tropidocephala eximus.*

Plate XVIII.

1-3. *Delphax lazulis,* male pygopher.
4. *D. disonymos,* the same.
5. *Lyricen imthurni,* profile.
6. Head and nota of the same.

7. Face of the same.
8. *Thyrocephalus leucopterus,* tegmen.
9. *Nesocore fidicina,* nymph.
10. Face of the same.
11. *Proterosydne arborea.*
12. Face of the same.
13. *Sikaiana nesiope,* tegmen.
14. *Smicrotatodelphax perkinsi.*
15. *Delphax matanitu.*
16. *Gelastodelphax histrionicus.*

Plate XIX.

1-3. *Lyricen imthurni,* male genitalia.
4-5. *Muiria stridula,* the same.
6-8. *Proutista lumholtzi,* the female genitalia.
9. *Philadelpheia pandani,* the male genitalia
10. *Nesoniphas insignissima* head and nota.
11. The same in profile.
12. *Phaciocephalus viticnsis,* head &c.
13. Profile of the same.
14. Face of the same.
15. *Swezeyia lyricen,* head and nota.
16. Face of the same.
17. The same in profile.
18. Antenna.
19. The same enlarged.
20. *Phaciocephalus miltodias*

Plate XX.

1. *Pyrrhoneura citharista,* wing.
2. The same, stridulatory area.
3. *Lyricen imthurni,* wing.
4. Stridulatory area of the same.
5. Variant venation of No. 3.
6. *Pyrrhoneura saccharicida,* wing.
7. Stridulatory area of the same.
8. *Proutista moesta,* wing.
9. Stridulatory area of the same.
10. *Muiria stridula,* profile.
11. Base of flight organs in same.
12. Wing of same.
13. Dorsal view of same.

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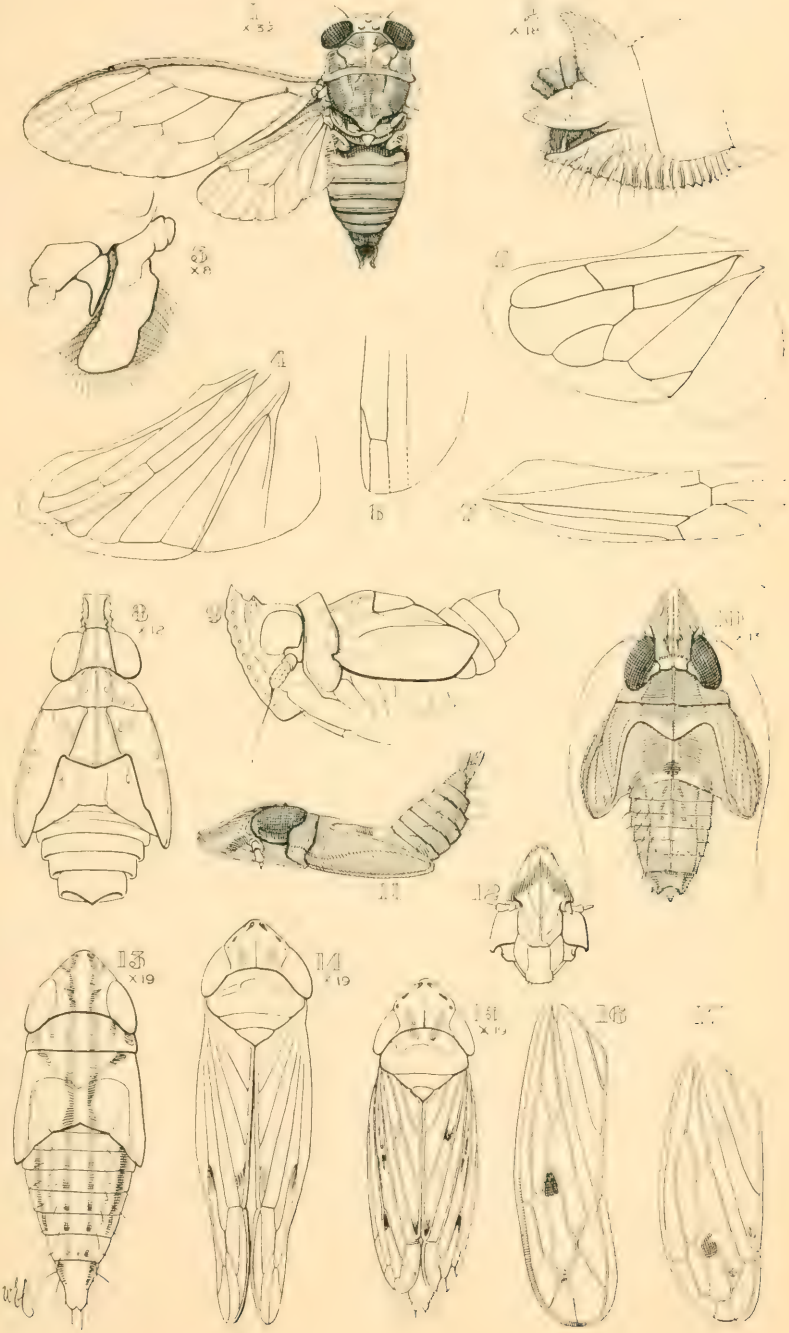

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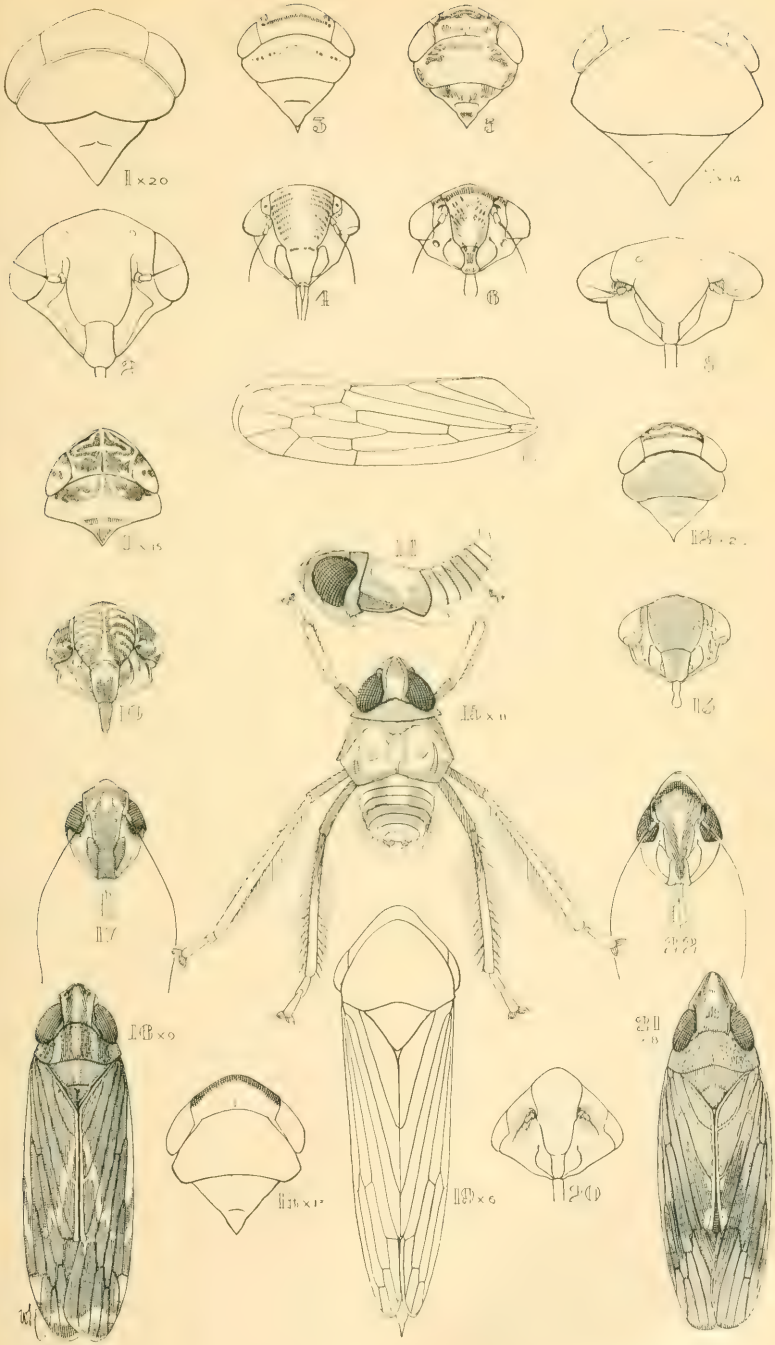

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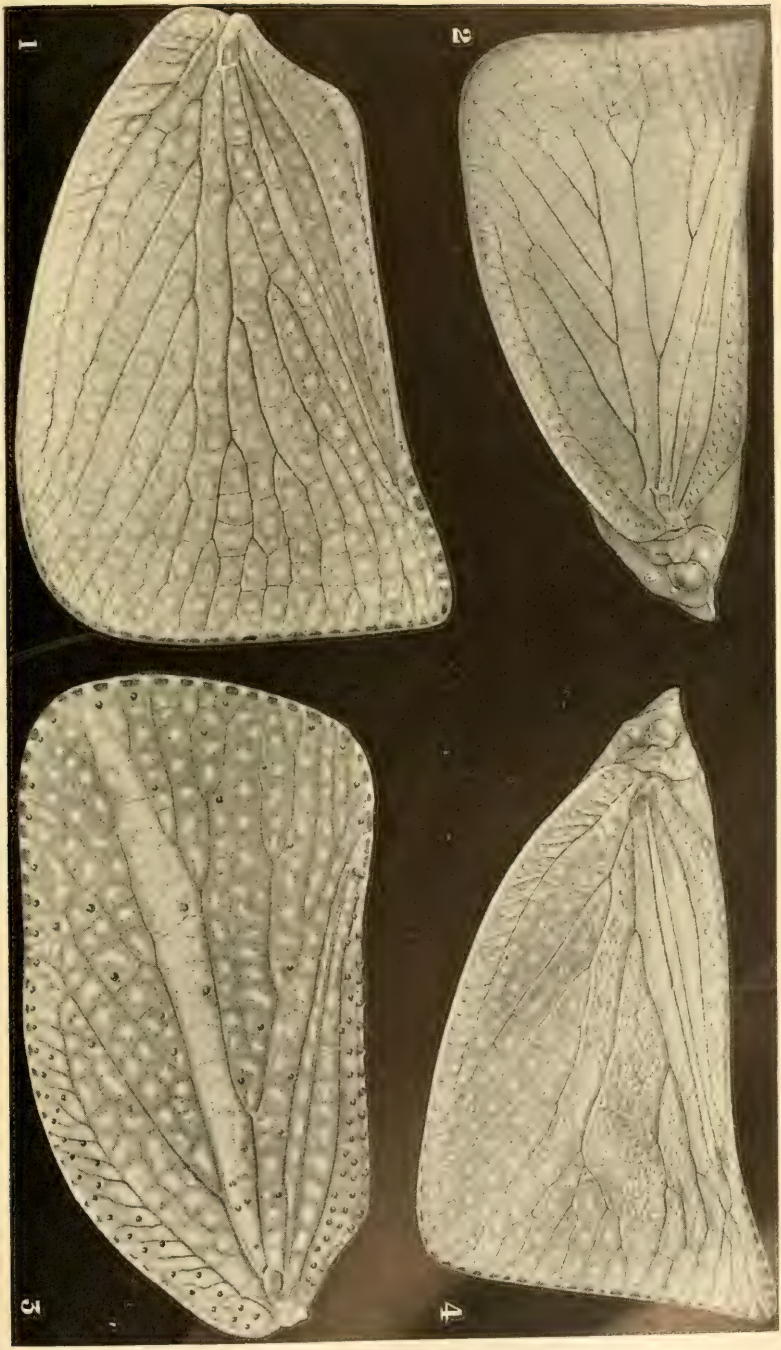

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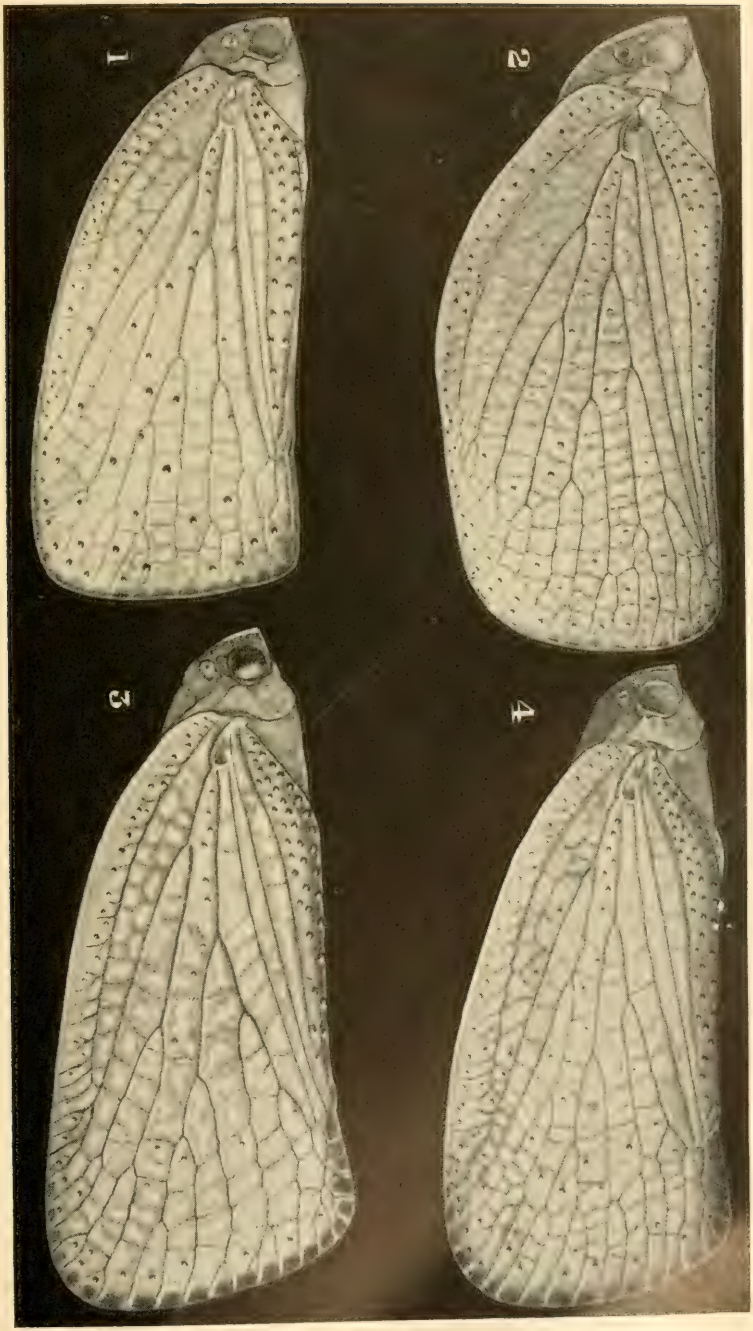

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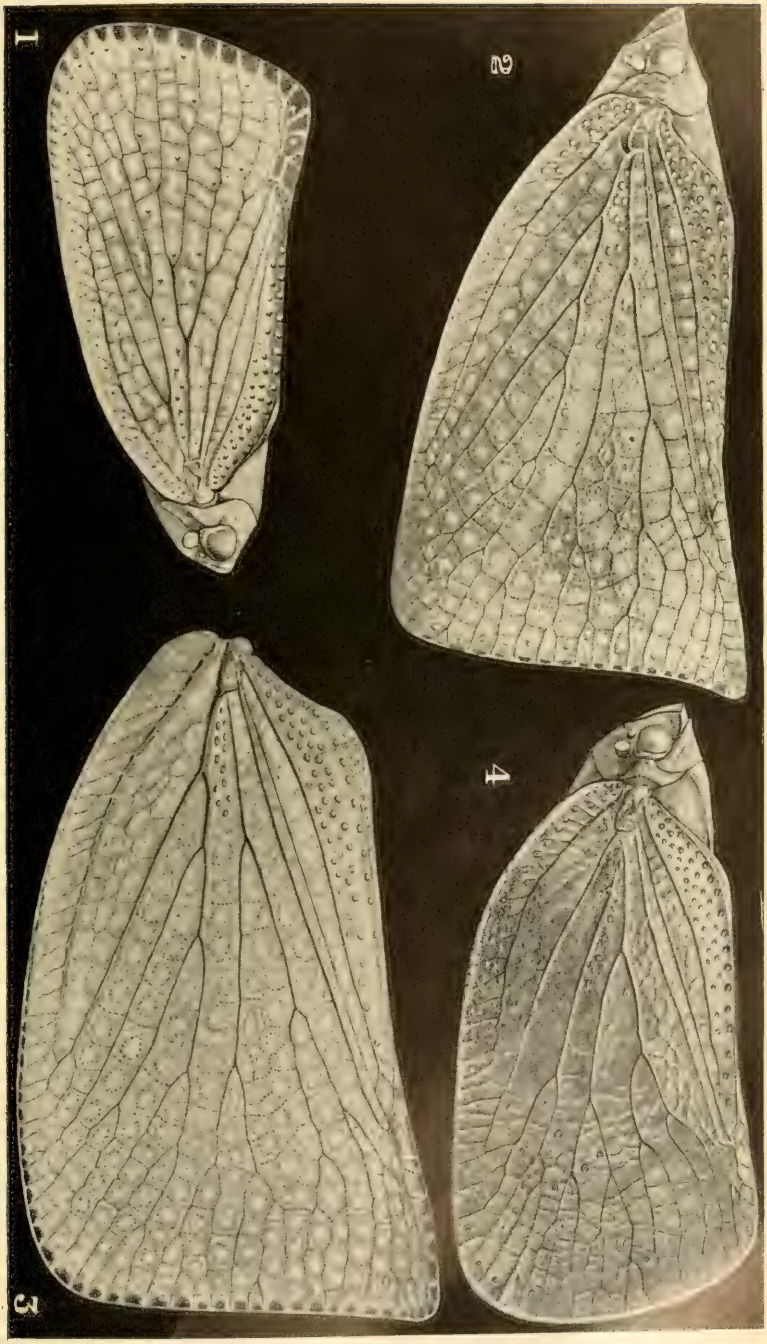

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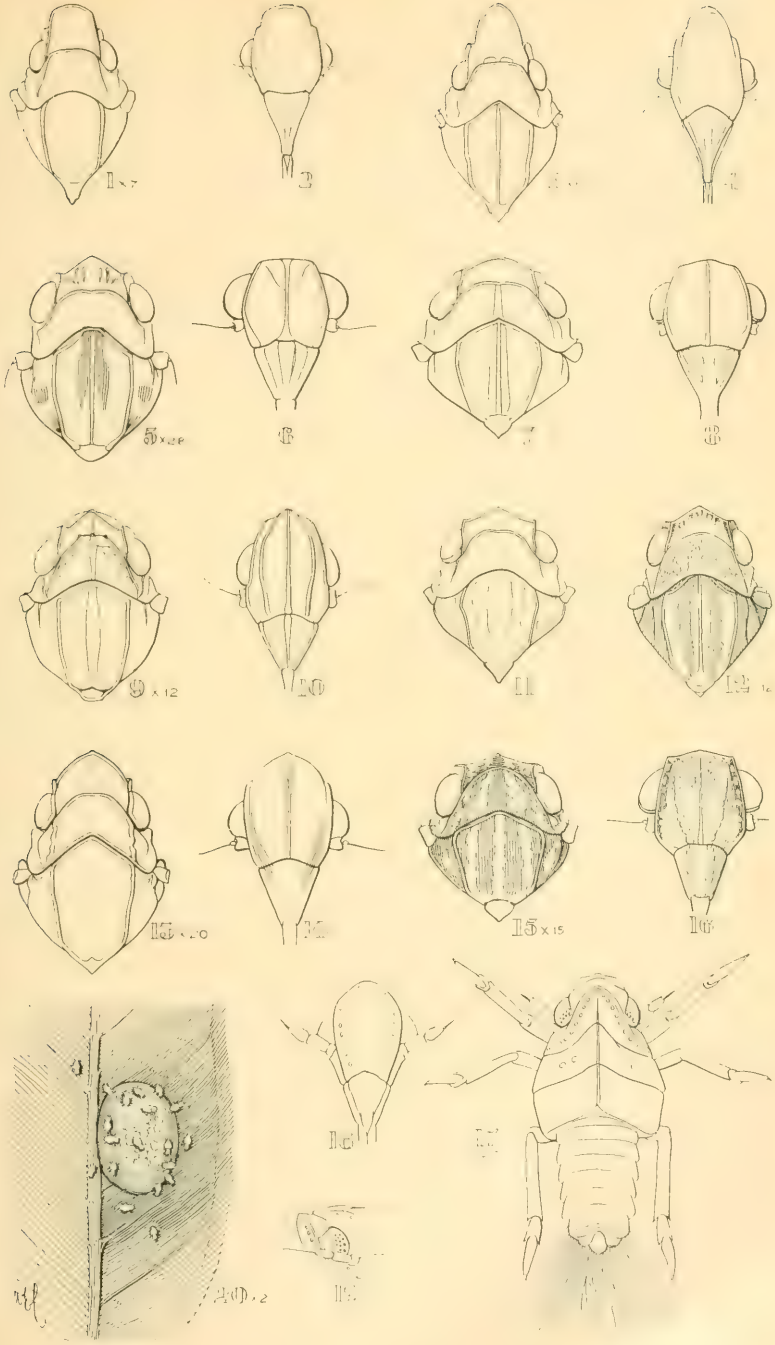

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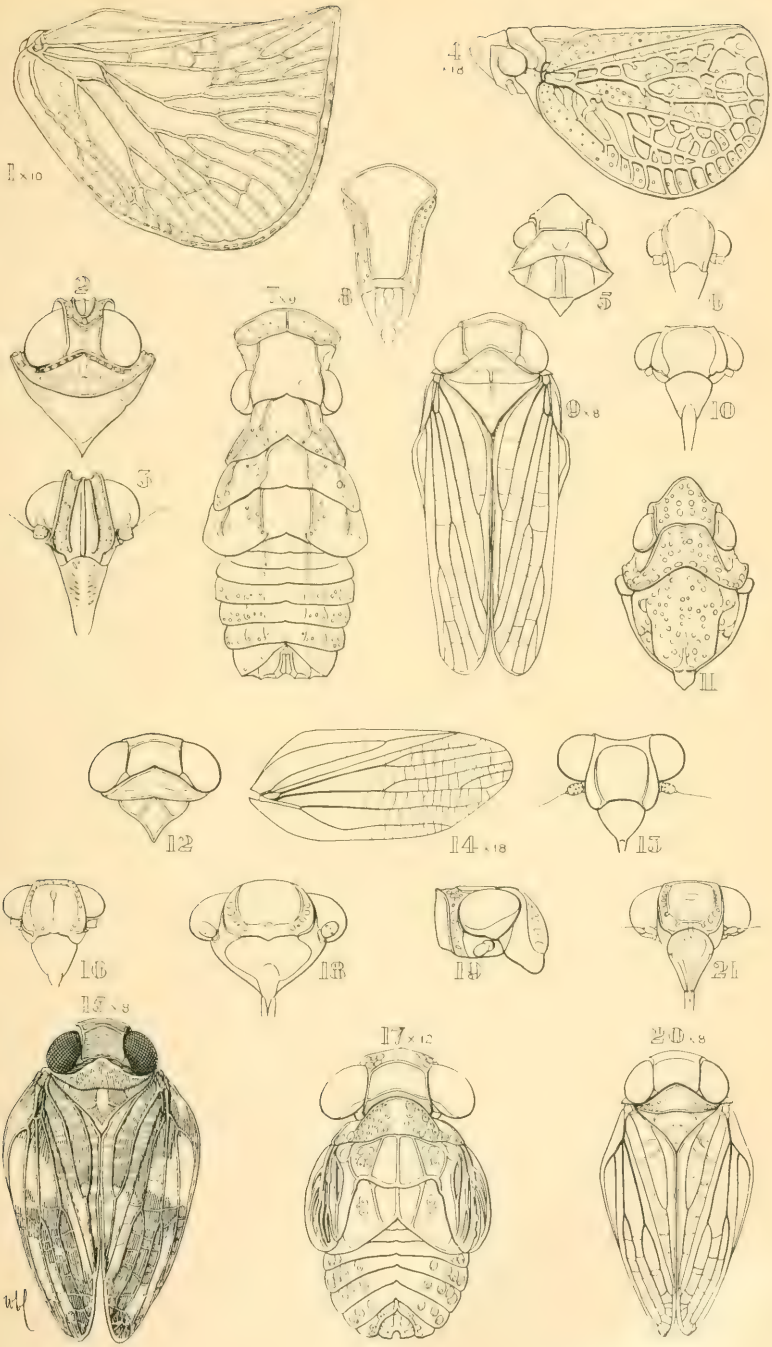

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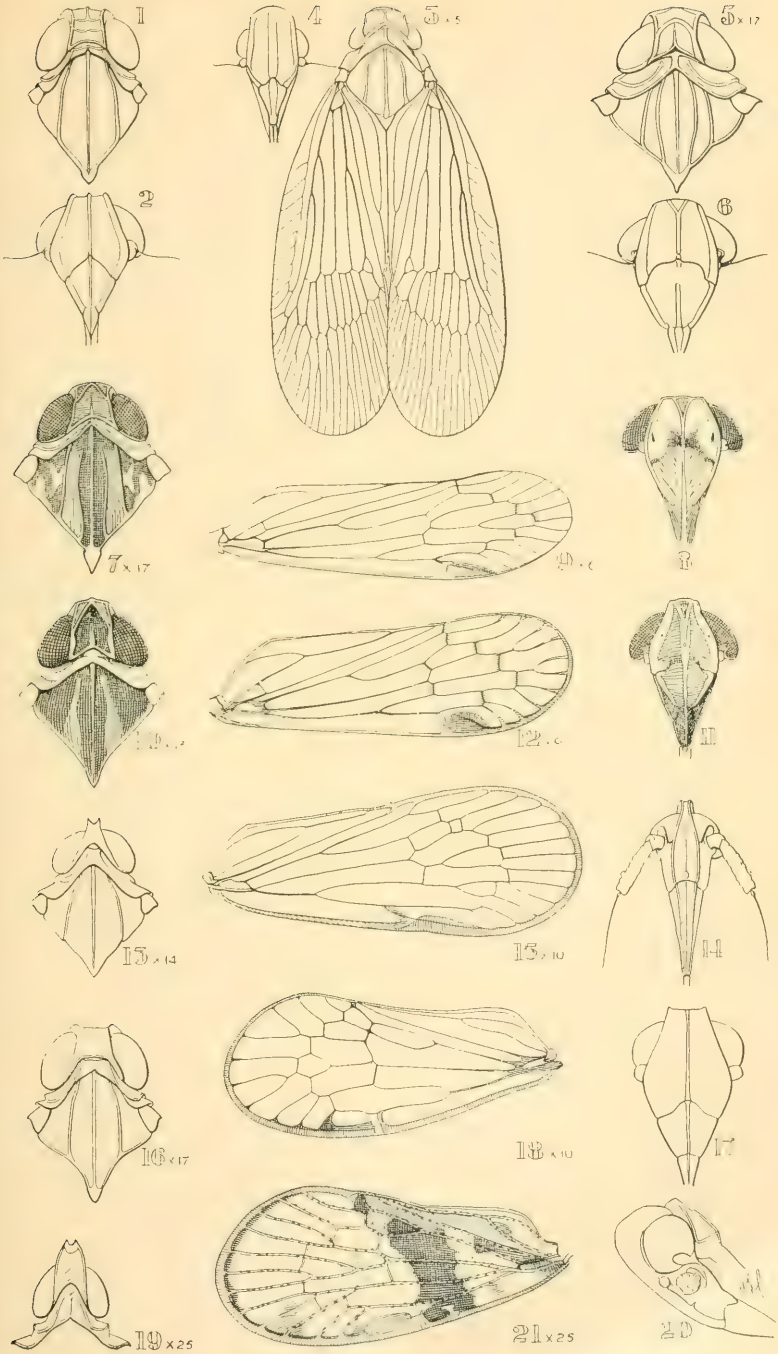
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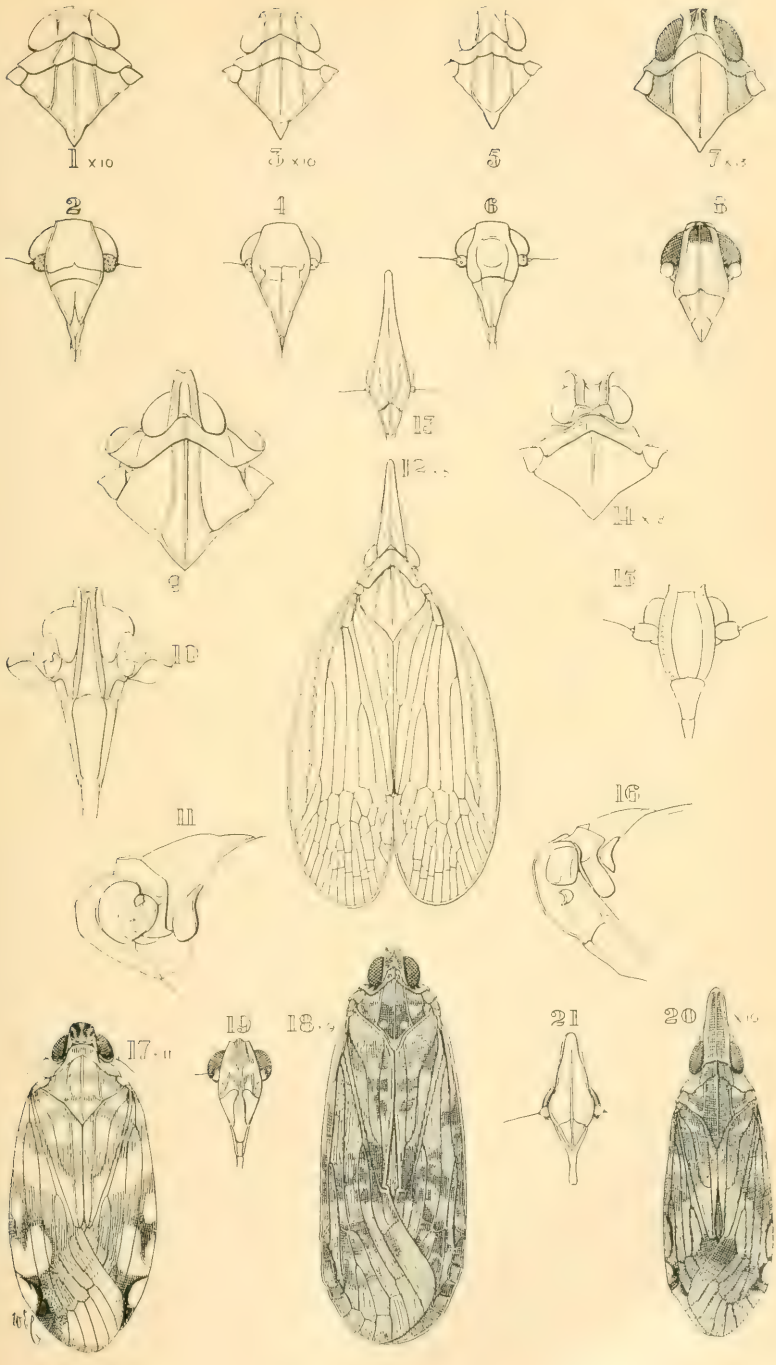

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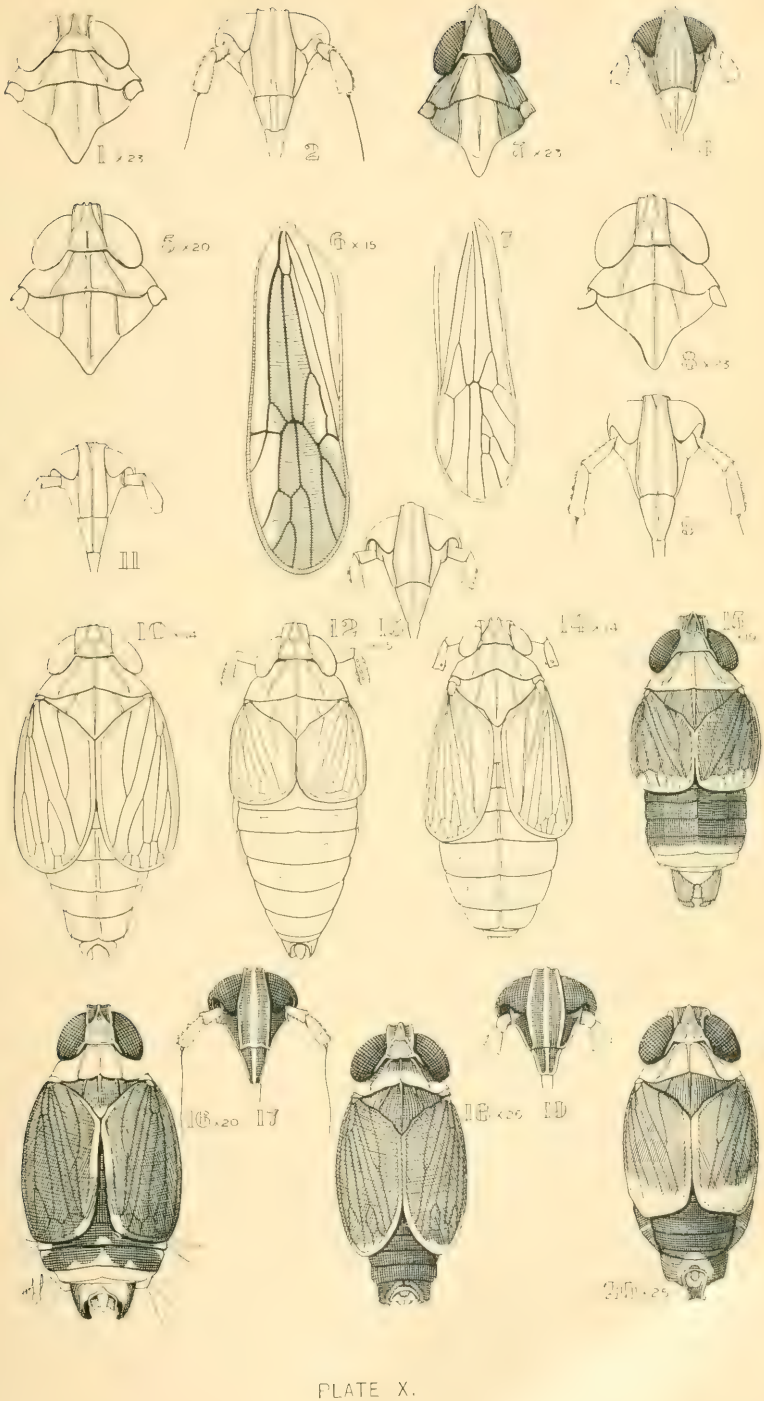

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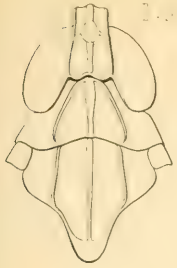

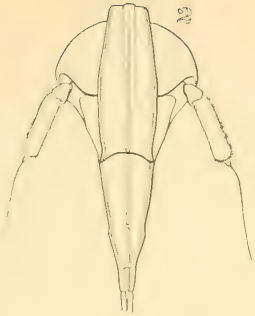

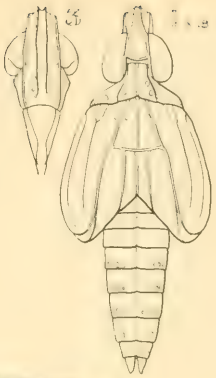

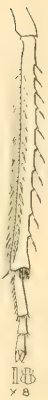

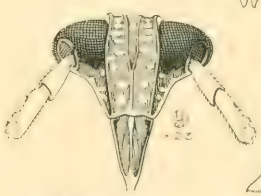

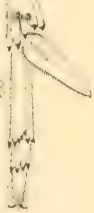

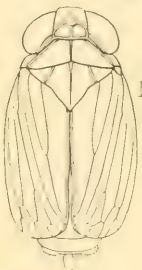

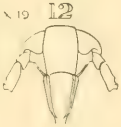

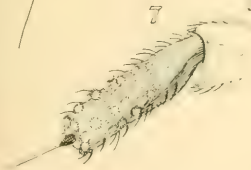

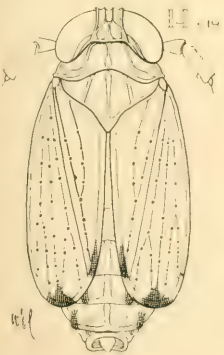

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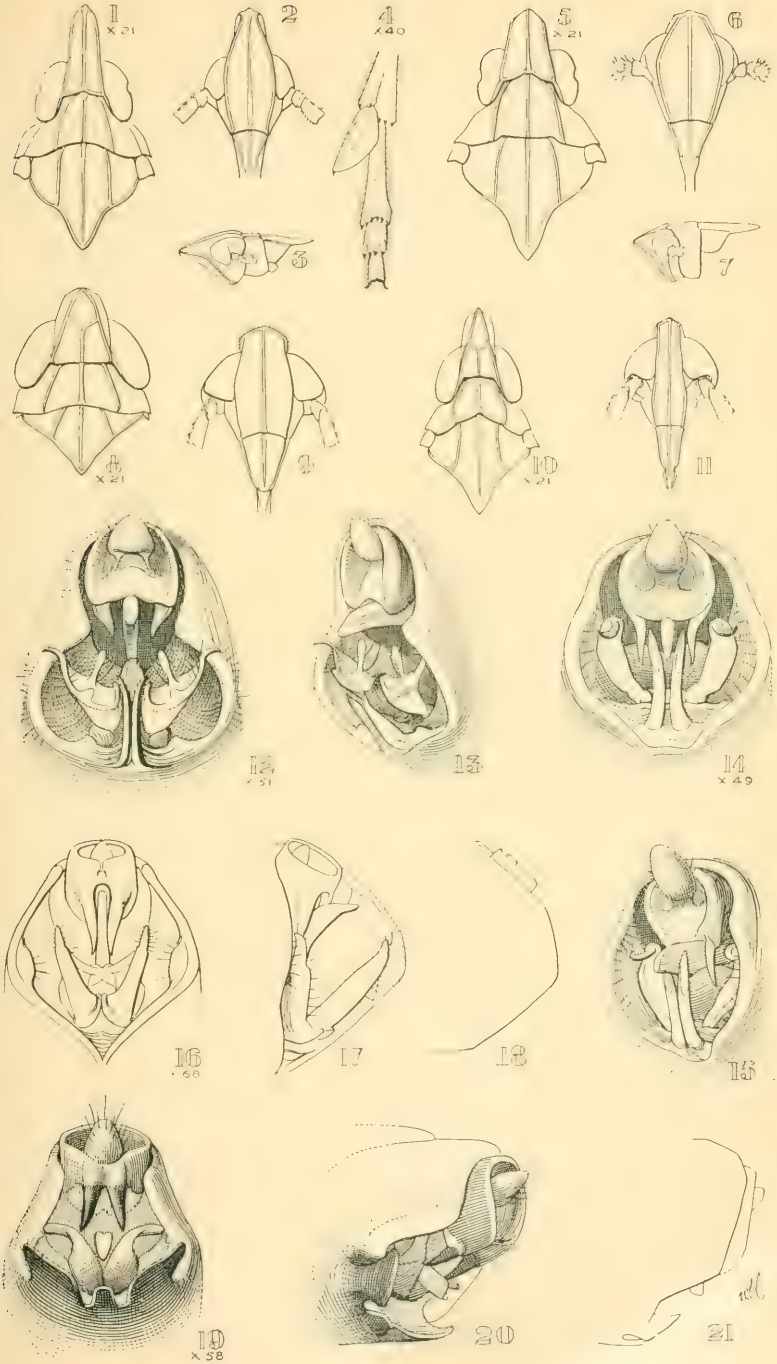
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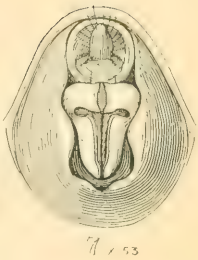

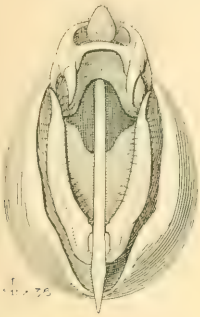

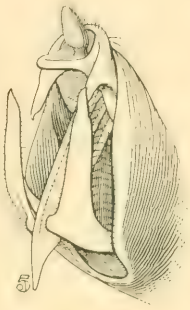

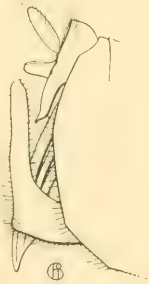

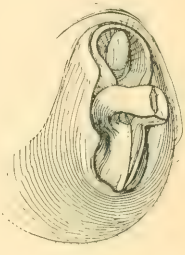

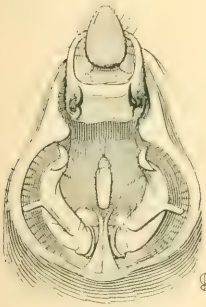

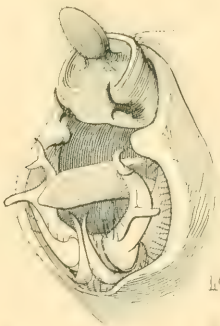

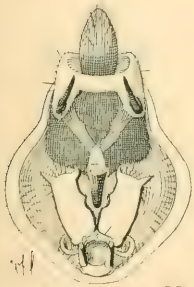

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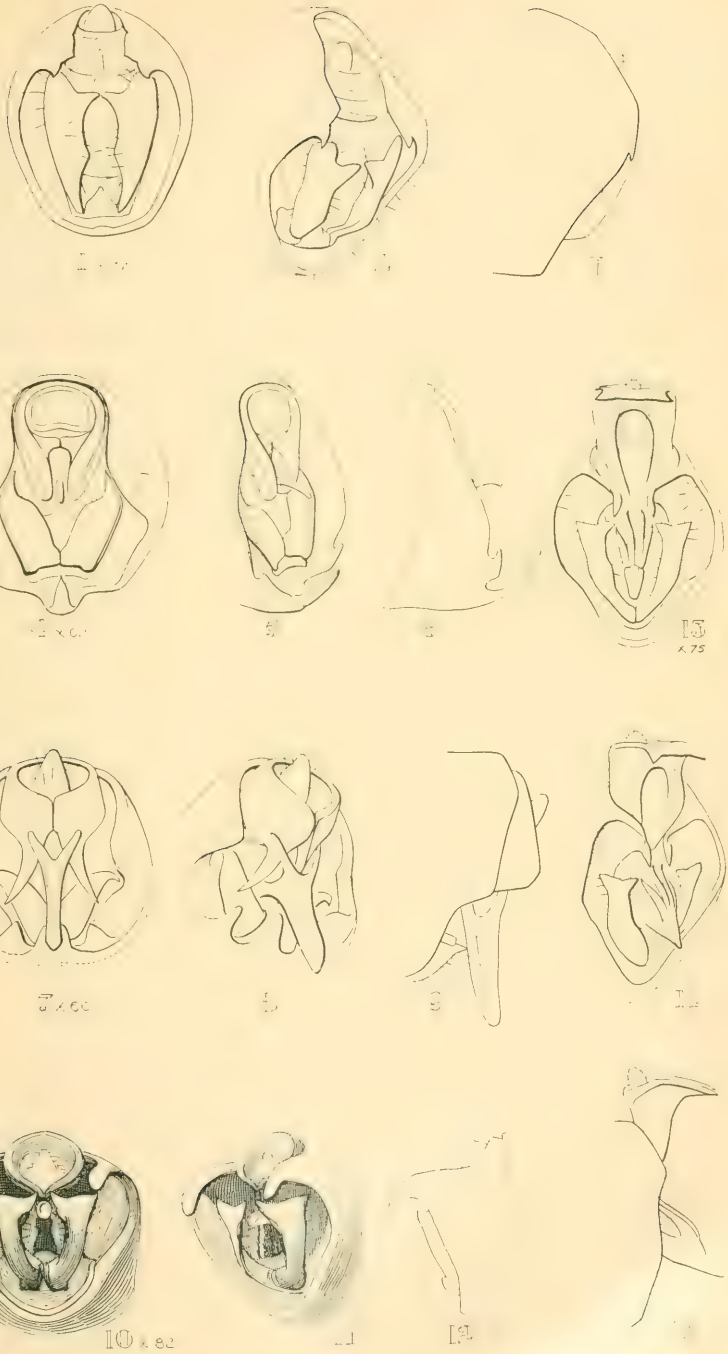

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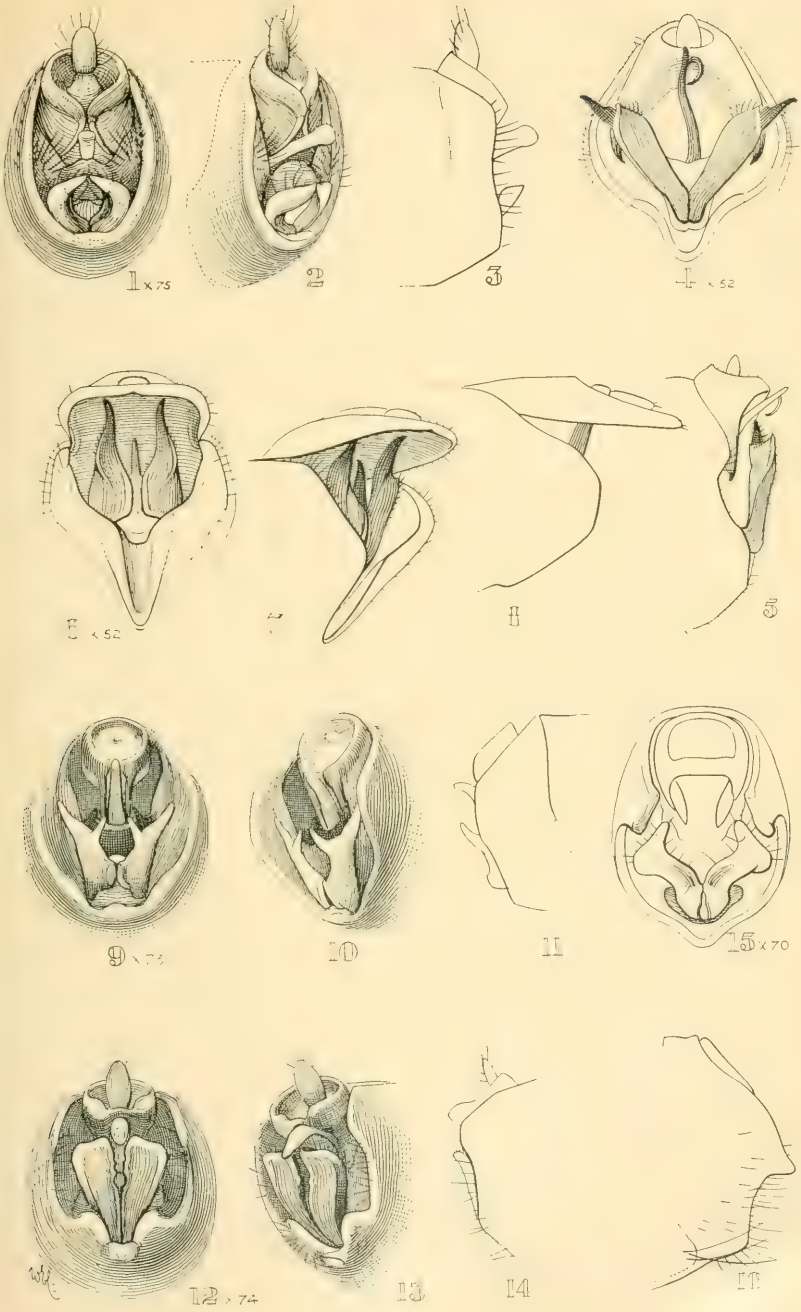

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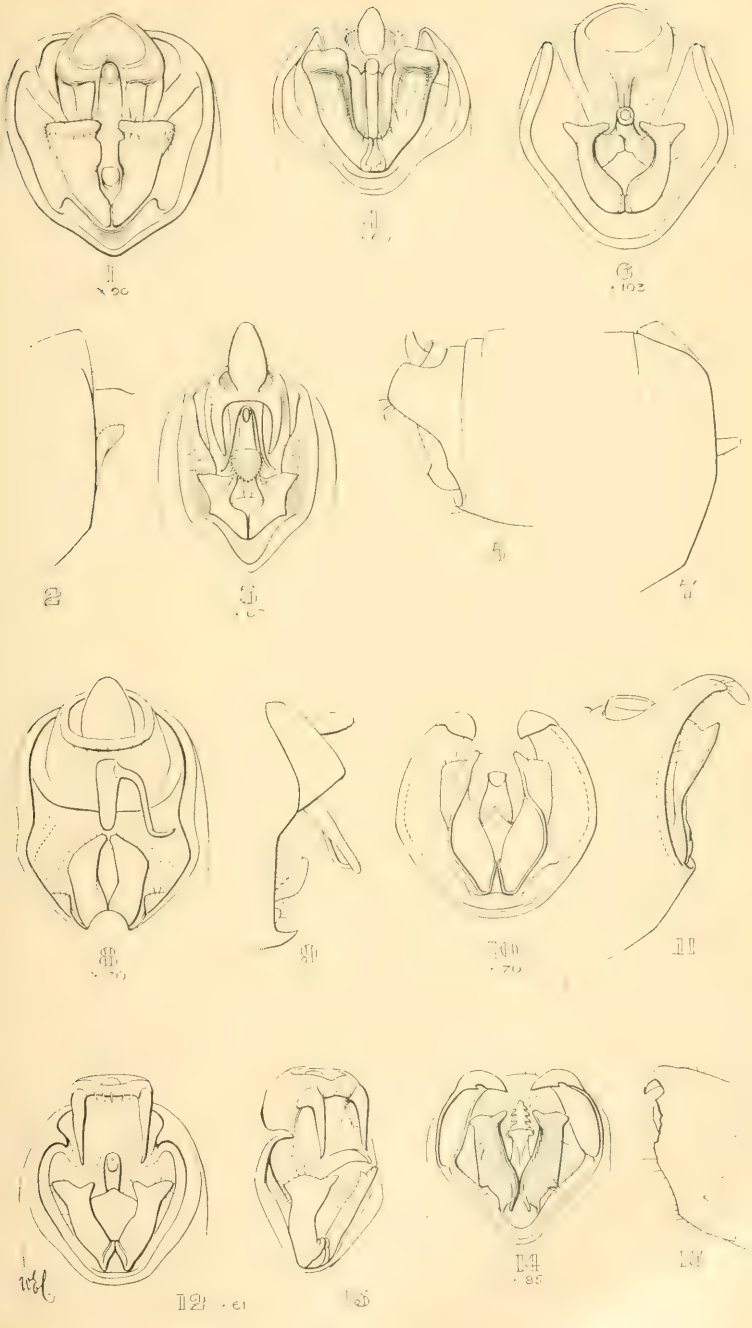

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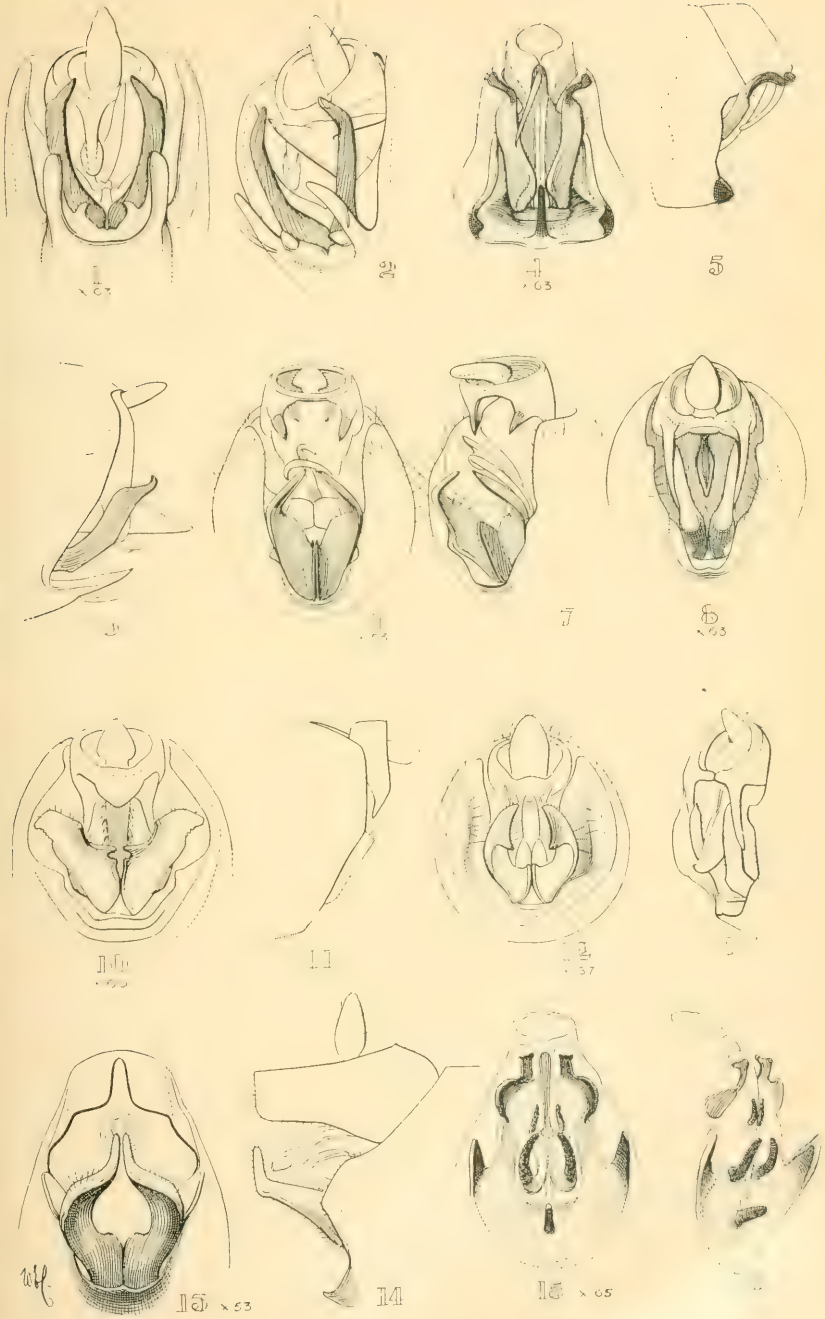


PLATE XVII.

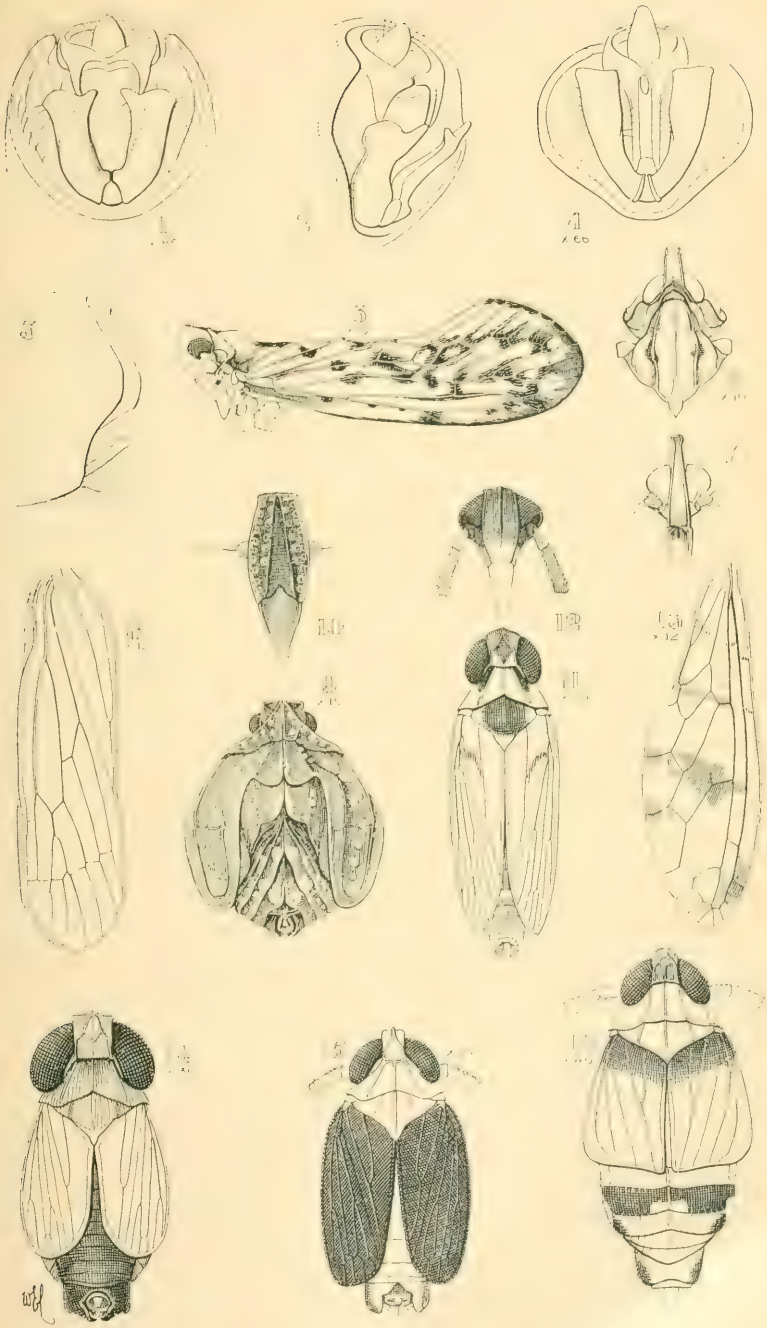


PLATE XVIII.

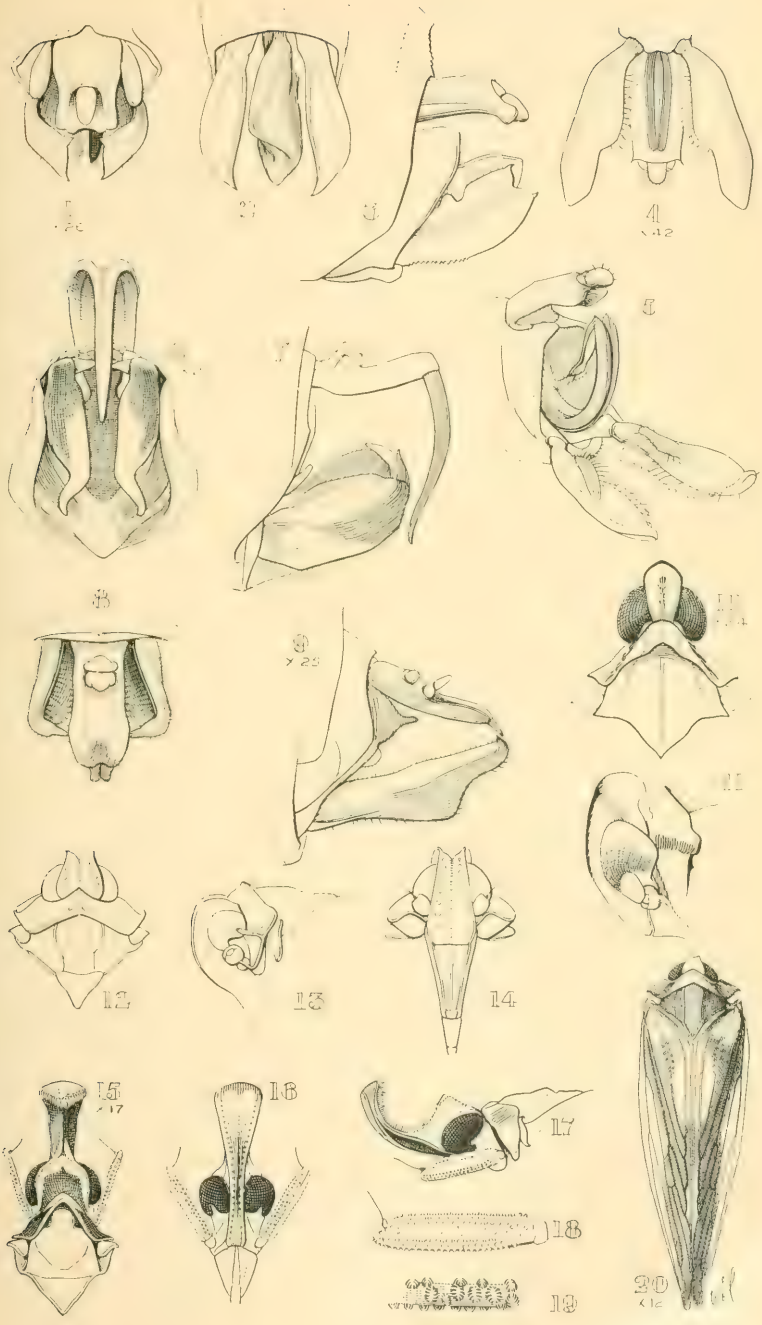


PLATE XIX.

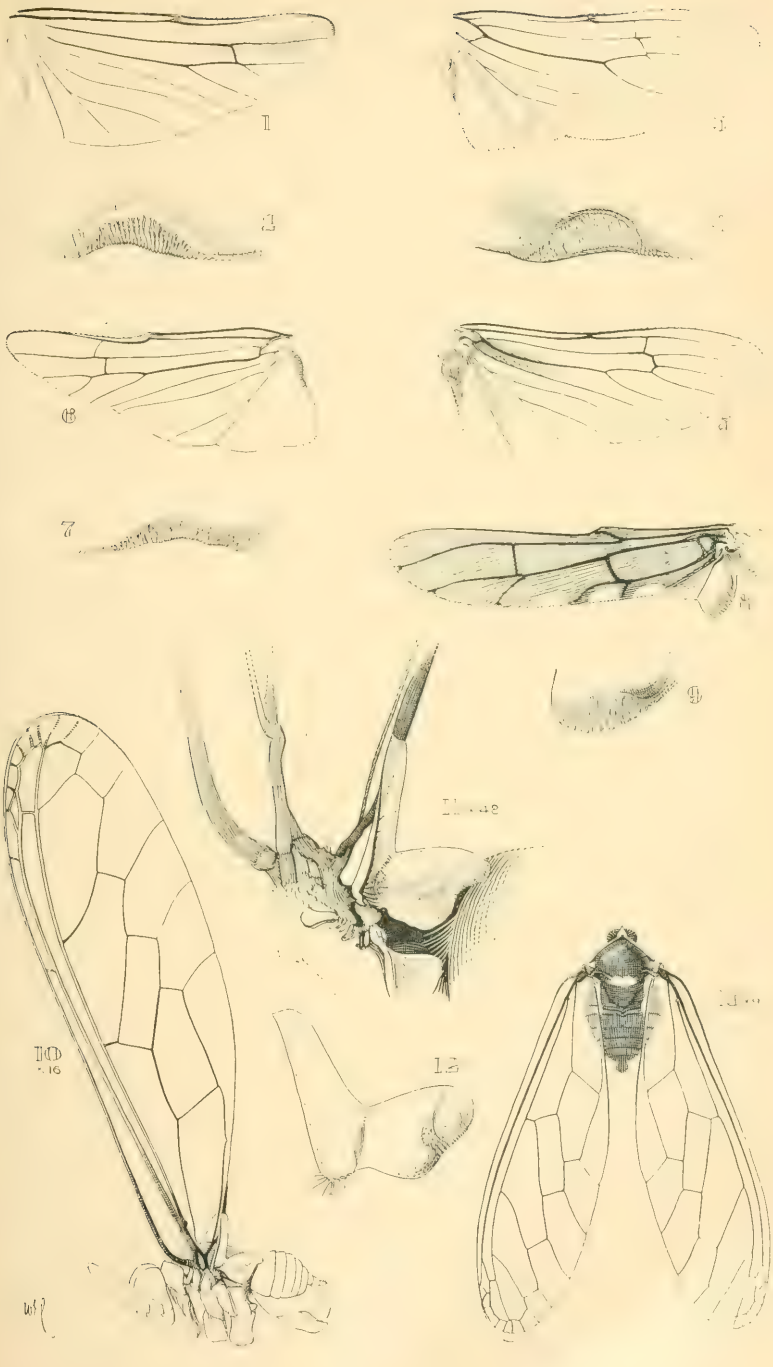


PLATE XX.

ivision of Entomology

Bulletin No. 4

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

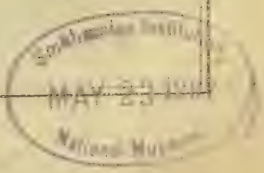
Parasites of Leaf-Hoppers

By R. C. L. PERKINS

Leaf-Hoppers

By C. W. KIRKALDY

HONOLULU, T. H.
MAY 1, 1907



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DIVISION OF ENTOMOLOGY

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Parasites of Leaf-Hoppers

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HONOLULU, T. H.
MAY 1, 1907

LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar Planters' Association, Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication Bulletin IV of the Division of Entomology. This is based almost entirely on the parasites and leaf-hoppers recently collected and studied by Mr. Koebele in Arizona. It has been prepared by Mr. Kirkaldy and myself.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., April 3rd, 1907.

GENERAL REMARKS ON PARASITES OF LEAF-HOPPERS.

In Bulletin I of the Division of Entomology an extensive account of leaf-hoppers and their natural enemies was prepared by the members of the staff, and in Bulletin II some additional observations were recorded by Mr. F. Muir, who visited Fiji, for the purpose of investigating leaf-hoppers and other insects in that group. In the present Bulletin a large number of parasites observed and collected by Mr. Koebele, chiefly in Arizona, are recorded, as well as such of their hosts as can be at present determined. A considerable amount of material, consisting of leaf-hoppers themselves, left over from Mr. Koebele's and my own expedition to Australia and from Mr. Muir's to Fiji has also been worked out and is ready for publication. In addition to these collections my work on the parasites of leaf-hoppers has been greatly aided by other specimens received from Mr. Koebele. In the summer of 1905 he visited Germany on a vacation trip, and during this vacation was so good as to collect for me a considerable amount of European material. These European specimens have been of the greatest service in working out the American species, and enable me to correct a number of errors in my former papers on the Dryinidae. Mr. Koebele not only sent over specimens of these and other parasites bred or captured by himself, but also a number of cocoons and puparia, that he had obtained there. It was very satisfactory to breed here, in these islands, species of European *Gonatopus, Chelogynus, Anteon* and others of the Dryinidae, as well as species of *Pipunculus* with *Verrallia aucta* and *villosa* of the Diptera, and to be able to examine all these alive. In addition to Mr. Koebele's consignments I have also examined some material recently received from China, collected by Mr. Muir. It will therefore be seen that the work done on the subject of leaf-hoppers, and their enemies, both in the field and study, has been of a very extensive character and it is possible to come to some general conclusions, as to what enemies keep the countless species of leaf-hoppers—all of which are potentially injurious—in check, throughout a large part of the world. One is at once struck with the fact, that whether in Europe, Asia, Australia or America, the parasites or predators

that destroy leaf-hoppers, in each country belong mostly to the same groups. Egg-parasites are everywhere present *Anagrus* of the Mymaridae attacks the eggs of the Delphacidae alike in Europe, America, Australia, Fiji and China, and even the species hardly differ in these countries; while *Paranagrus* has been found in Fiji, Australia and China, and *Ootetrastichus* of the Chalcid flies in the same countries. Other Mymarids of several genera attack the Jassid hoppers, some of which are also periodically decimated by the excessively minute Chalcids of the family Trichogrammidae, both in America and Australia. These latter likewise destroy the eggs of the allied Membracidae. Such Fulgorids as lay their eggs on the surface of plants have different egg-parasites. In Australia they are attacked by Proctotrupids, and also by Encyrtidae of the Chalcid group, but in other countries their enemies have not been investigated. A foremost place amongst beneficial insects must be assigned to all these egg-parasites, as by destroying the egg they kill the hopper before it arrives at a stage, when it can do injury. Of the other Hymenoptera, Dryinidae are no doubt ubiquitous throughout the world, and they attack many species of hoppers both in the Fulgorid and Jassid groups, and have also been reported as attacking Membracids. Cercopidae are, so far as is known, not attacked by them, but the young of these are, as is well-known to every field-worker, a favorite prey of various Fossorial Hymenoptera, e. g. *Harpactus* and *Gorytes*. The Fossors likewise yield species that prey on Jassids; amongst the minute Crabronidae, for instance, we have found the cells of the European *Crossocerus gonager* Lep. filled with a species of *Typhlocyba* that infests beech trees. In these islands, one may see a Mimesid (*Nesomimesa hawaiiensis*) hawking for various species of Fulgorid leaf-hoppers, but these are not its usual prey, which consists of certain Limnobiine Diptera. It is interesting to note that its attempt to seize the Fulgorids is usually a failure. As all the other known Hawaiian species of *Nesomimesa* prey on the Diptera mentioned, it would appear as if it were comparatively recently turning its attention to the Homoptera. The singular head-structure of the female wasp probably aids it in some way in capturing the flies, while ineffective for holding the other prey. The Dipterous Pipunculidae are also ubiquitous, and attack both Jassids and Fulgorids of various groups, alike. On the whole they appear to chiefly parasitize Jassids, but the Hawaiian species, so far as is known, are all parasitic on Fulgorids, in fact on Delphacids only.

The Stylopidae parasitize very diverse groups both in the Jassid and Fulgorid series. The little *Elenchus* seems to attack the Delphacidae in all localities, where these have been specially examined, and the specific characters of these parasites seem to be almost if not quite identical in widely separated countries; at least there is very little if any real difference between *Elenchus tenuicornis* of Europe and the examples found in Australia, Viti, and North America, that I refer to it. It is proper to state in this connection that one of the species of *Liburnia* attacked by *Elenchus* is found to be itself common to both Australia and North America and it would not be surprising to find that it also inhabits Europe, where, in any case, there are very closely allied species.

The Chalcids seem rarely to attack hoppers, after they leave the egg, but in Australia are two fine species of Encyrtidae, *Meniscocephalus eximius* and *Neocladia howardi,* which are bred from nymphs or adults of a Jassid (*Eurinoscopus*), and recently Mr. Muir has bred the latter parasite from quite another Jassid in China. Recently from a Jassid nymph in Arizona Mr. Koebele bred another distinct form of Encyrtid, described in this bulletin under the name *Thysanomastix Koebelei.* This species differs in habits from the others above mentioned, in the fact that several of the parasites emerged from a single host, and it is remarkable that the latter (*Oncomctopia lateralis*) survived its injuries for several days after their emergence, when one considers the size of the parasites.

Of predaceous insects it may be noticed in passing that the larvae of various Malachiid beetles, both in America and Europe, destroy the Delphacid hoppers that live on grasses, and some of them appear to be very voracious, so that on one occasion, Mr. Koebele had many parasitized leaf-hoppers destroyed by these beetle larvae, accidentally included in his breeding jars.

Of the parasites enumerated in this Bulletin, it was not attempted to introduce any into the Hawaiian islands, excepting the minute egg-parasite, *Trichogramma helocharae.* An attempt was made to breed this on the eggs of *Perkinsiella,* but, as Mr. Koebele and myself had expected, without success. I was, however, able to establish it at large on the eggs of a common introduced Jassid, and have, since it was liberated some six or nine months ago, frequently met with it. The fact that Jassid leaf-hoppers abound in cane fields of other countries whence cane has frequently been imported into these islands, while in the event of any of these showing up here, we have practically no natural enemies which would destroy them, made it worth while to establish the *Tricho-*

gramma here. It is a very effective enemy of its proper host, for though I bred scores of the parasites from the leaf-hopper eggs sent here from California, not one single leaf-hopper emerged, and Mr. Koebele had just the same experience in that State.

SYSTEMATIC ACCOUNT.

New species and genera of Hymenoptera here described.

DRYINIDAE.

Apterodryinus gen. nov.
  torvus sp. nov.
Chalcogonatopus Perk.
  leptias sp. nov.
  paraleptias sp. nov.
  cuprepes sp. nov.
  cuprepoides sp. nov.
  argyrias sp. nov.
  rapax sp. nov.
  frequens sp. nov.
  solitarius sp. nov.
  echo sp. nov.
  herbarum sp. nov.
  xestocephalus sp. nov.
  unicus sp. nov.
  simulator sp. nov.
  koebelei sp. nov.
  perdebilis sp. nov.
Eucamptonyx gen. nov.
  testaceus sp. nov.
Agonatopus gen. nov.
  pallidicornis sp. nov.
  var. dubiosus var. nov.
  ferrugineus sp. nov.
  picescens sp. nov.
  innitidus sp. nov.
  heterothorax sp. nov.
Agonatopoides gen. nov.
  synchromus sp. nov.
Ncogonatopus Perk.
Pseudogonatopus Perk.
  arizonicus sp. nov.
  autoxenobius sp. nov.
Neodryinus Perk.
  arizonicus sp. nov.
  dubiosus sp. nov.
Paradryinus Perk.
  mexicanus sp. nov.
Hesperodryinus gen. nov.
  amphiscepae sp. nov.
  arizonicus sp. nov.
  audax sp. nov.
Perodryinus gen. nov.
  amoenus sp. nov.
Eukoebelcia Perk.
  arizonica sp. nov.
Deinodryinus gen. nov.
  paradoxus sp. nov.
  quercicola sp. nov.
Chelogynus Hal.
  lusus sp. nov.
  funestus sp. nov.
  melanacrias sp. nov.
Anteon Jur.
  arizonensis sp. nov.
Aphelopus Dalm.
  arizonicus sp. nov.
  viduus sp. nov.
  pucherrimus sp. nov.
  microleucus sp. nov.

mimus sp. nov.
mimoides sp. nov.
Gonatopus Ljung.
haplothorax sp. nov.

ENCYRTIDAE.
Thysanomastix gen. nov.
koebelei sp. nov.
TRICHOGRAMMIDAE.
Trichogramma West.
helocharae sp. nov.

DRYINIDAE.

Table of some genera of Dryinidae.

1	(48)	Tarsi of the front legs always with the fifth joint more or less modified, and with one claw unusually developed, and so articulated with the fifth joint as to be capable of closing back on this, and with it forming more or less perfect chelae or pincers.
2	(23)	Mesonotum forming a narrow bridge or stalk between the large pronotum and the propodeum; species entirely wingless.
3	(12)	Chelar claw armed with well-developed lamellate denticles of the same nature as those on the fifth tarsal joint beneath, and with a tooth* on its lower edge near the apex (Fulgorid parasites).
4	(7)	Labial palpi three-jointed.
5	(6)	Maxillary palpi six-jointed .....*Apterodryinus.*
6	(5)	Maxillary palpi five-jointed .....*Eucamptonyx.*
7	(4)	Labial palpi two-jointed.
8	(9)	Maxillary palpi four-jointed .....*Pseudogonatopus.*
9	(8)	Maxillary palpi two-jointed.
10	(11)	Pronotum divided by a distinct transverse..... ..... *Paragonatopus.*
10	(11)	Pronotum divided by a distinct transverse impression
12	(3)	Chelar claw not armed with well developed lamellate denticles, but almost unarmed, or with small pointed spinules or spinose hairs projecting between two ridges, which appear as a convex edge, when the claw is viewed laterally; very rarely with an anteapical tooth near the tip (Jassid parasites).
13	(16)	Labial palpi three-jointed.
14	(15)	Maxillary palpi six-jointed .....*Chalcogonatopus.*
15	(14)	Maxillary palpi five-jointed .....*Agonatopus.*
16	(13)	Labial palpi two-jointed.
17	(20)	Maxillary palpi four or five-jointed.

* This tooth is absent in Eucamptonyx.

18 (19) Maxillary palpi five-jointed .....*Gonatopus.*
19 (18) Maxillary palpi four-jointed .....*Neogonatopus.*
20 (17) Maxillary palpi two or three jointed.
21 (22) Maxillary palpi three-jointed; head not distinctly concave above .....*Pachygonatopus.*
22 (21) Maxillary palpi two-jointed; head concave..... .... *Epigonatopus.*
23 (2) Mesonotum wide, not forming a narrow stalk, species winged or with rudimentary wings.
24 (25) Front wings with a parastigma, radius complete, reaching the tip of the wing .....*Lonchodryinus.*
25 (24) Front wings without the above characters.
26 (37) Posterior lateral angles of the pronotum not attaining the tegulae.
27 (28) Maxillary palpi very short, four-jointed; labial palpi two-jointed; (parapsidal furrows distinct, but fine, meeting posteriorly and enclosing a narrow triangular area) .....*Echthrodelphax.*
28 (27) Maxillary palpi long and conspicuous, often extending to or behind the posterior margin of the head beneath, six-jointed; the labial palpi three-jointed.
29 (30) Postscutellum extremely short, transversely linear, vertex of head not convex, generally more or less concave . . .. *Neodryinus* (?=*Dryinus*)
30 (29) Postscutellum, well developed, usually about half as long as the scutellum, vertex of head convex.
31 (32) Head posteriorly acutely wedge-shaped, its hind margin well rounded, posterior ocelli placed far behind the hind margins of the eyes .....*Hesperodryinus.*
32 (31) Head posteriorly not acutely wedge-shaped, nor well-rounded behind, but straightly transversely margined or nearly so; posterior ocelli usually almost on a line with the hind margins of the eyes (if placed behind these the vertex is straightly margined posteriorly).
33 (36) Chelae long, the chelar claw being well developed.
34 (35) Vertex distinctly margined posteriorly and the margin continued round the occiput .....*Paradryinus.*
35 (34) Vertex indistinctly margined, the margins failing towards the sides .....*Cholorodryinus.*
36 (33) Chelae very short, the chelar claw simply a strong spine, with dilated base for articulation *Perodryinus.*
37 (26) Lateral angles of pronotum attaining the tegulae.

38 (39) Antennae extremely long and filiform, the third joint subequal to, or somewhat *shorter* than, the fourth, which is more than twelve times as long as wide .... *Thaumatodryinus.*

39 (38) Antennae without the above characters.

40 (41) Eyes hairy; mandibles tridentate, or with an excessively minute fourth tooth intercalated between the first and second, abdomen with a short but distinct pedicel, reaching to apex of hind coxae..... ..... *Eukoebeleia* (?=*Bocchus*)

41 (40) Eyes not hairy; mandibles with four well-developed teeth, abdomen petiolate or subpetiolate, but not pedicellate.

42 (43) Fourth tarsal joint of front legs very long and slender, twice as long as that part of the fifth which lies between its articulation with the fourth and its true apex, i. e., not less than twice as long as the fifth excluding its basal process; stigma narrowly elongate-ovate, the radius long, bent or angulated at about the middle of its length.....*Deinodryinus.*

43 (42) Fourth tarsal joint of front legs at most about as long as the fifth, excluding its backward basal process, sometimes much shorter still; stigma more widely ovate, sometimes very large, the radius in many species hardly continued beyond its bend or angulation.

44 (45) Fourth joint of front tarsi elongate, much longer than the third, and articulated to the fifth at, or not far from, the middle of the whole length of this joint, including the backward process..... .....*Chelogynus* (=*Neochelogynus*)

45 (44) Fourth joint of front tarsi small, and articulated to the fifth near to its free extremity, much nearer to this than to the apex of the joint; or in other words the backward process of the fifth is very short, much less than half the length of the whole joint.

46 (47) Antennae becoming wider towards the apex; the propodeum bounded by a raised line at the truncation, and generally with a more or less defined median area on its posterior face.....*Anteon* (=*Prosanteon*)

47 (46) Antennae simply filiform, propodeum without the above characters .....*Paranteon.*

48 (1) Tarsi of front legs normal not chelate....*Aphelopus.*

On the genera of Dryinidae allied to *Gonatopus*.

In my former papers (Bull. I Pt. 1 and 10) I divided the insects that are usually assigned to *Gonatopus* into a number of new genera. It is with some reluctance that one breaks up a genus of insects so similar in general form and strikingly distinct from any other, but there are very good reasons for this division. In the first place my studies have convinced me that the species assigned to *Gonatopus* have been derived from winged forms, which would themselves universally be assigned to distinct genera, and that the great superficial resemblance of species differing in most important characters is due to convergence from similarity of habits and does not indicate their true phylogeny.

Further, it is obvious that the genus *Gonatopus* (s. l.) is a difficult one, and the difficulties are such as will be likely to increase, as species are added to it. Obviously the species are extremely numerous. In a few limited localities, and these by no means rich, as compared with some now known to us, Mr. Koebele and myself were able in a short time to collect some thirty-five new species. Most are of limited range or local. The species in Sydney, N. S. W. are generally different from those found at Brisbane and Bundaberg, Queensland, and the species in Arizona are certainly mostly distinct from the Californian. The genus, in its wide sense, appears to be ubiquitous, and even occurs naturally in such remote oceanic islands as the Hawaiian group, while it is well represented in the Viti islands.

Recently in an area of a few square miles in Arizona Mr. Koebele bred and collected at least twenty-five species in a short time. These facts, and the consideration that many species have been described by others from caught specimens, lead me to estimate the number of species of *Gonatopus* (s. l.) at fully one thousand, and probably several times this number may eventually be found. I therefore believe that students of the Dryinidae will sooner or later be very glad to adopt in the main the characters employed by me for the division of the genus *Gonatopus*, although to examine the mouth-parts accurately requires a considerable amount of labor, and a trifling amount of skill, if the specimens are to be dissected without material injury.

I have still thought it better at present to neglect the classification of the males, and have avoided describing numbers of possibly new species in this sex, the names of many of which would have to be eventually sunk as synonyms. Whether it will be easy to find generic characters for the comparatively unspecialized males

—characters, I mean, to correspond with those given by me for the females—I cannot at present state. In some cases I know the mouth parts of the males and females agree entirely in the number of joints of the palpi. At any rate at present the matter is not of much importance, nor will it become so until most of the species are bred. In field collecting few males of *Gonatopus* (s. l.) are ever met with. In Mr. Koebele's collection from Arizona there are few or no captured males, though he bred a number of examples of some species. Further in some, and probably in many species, males are very difficult to obtain even by breeding; perhaps in some this sex does not exist. For economic purposes, we have bred brood after brood of a Vitian *Haplogonatopus* and have distributed the females in numbers to many plantations to help in controlling the sugar cane leaf-hopper, but in all this time only two or three males have ever been bred. In many species, when bred, the males appear to be of such weak and delicate constitution, that one doubts whether, except under particularly favorable circumstances, they can take any part in the propagation of their species.

In dividing *Gonatopus* I first separate the species into those which parasitize Jassids and those which attack Fulgorids. This can be done with the greatest ease by examining the chelae of the front legs, when one has become familiar with their structure, which I have elsewhere described. Each of these groups is then divided into numerous genera on the number of joints in the palpi, the labial palpi being always formed of two or three joints, the maxillary having from two to six. In my opinion the genera with three-jointed labial palpi are essentially different from those with two joints and this remark applies to both females and males. The use of the number of joints in the palpi for the subdivision of *Gonatopus* appears to me exactly comparable with that in the genus of wasps *Synagris*, but it is more necessary in the former on account of the much greater number of species that exist. The main facts concerning *Synagris* (s. l.) can be found in the works of de Saussure by those interested.

Considerable caution is necessary in dealing with the specific value of color, and even of sculpture, in specimens of the *Gonatopus* group. As I have elsewhere stated, in some species, in which when freshly emerged the abdomen is black, after they have lived some days or weeks, the color becomes entirely ferrugnous. Others in which the abdomen is ferruginous, after a week or two become black in color. The color of the antennae and of the thorax and legs is variable in many species, and even the sculp-

ture is far from constant. Cameron in dealing with the Central American species has long since allowed considerable variability in the Dyrinidae in most of these respects, and from the fine collections and many bred specimens, I have handled, I can fully confirm his opinion.

Apterodryinus gen. nov.

General form as in *Gonatopus* and its allies, mandibles with four teeth, maxillary palpi 6-jointed, labial 3-jointed. Pronotum distinctly emarginate in front, no distinct transverse impression or constriction, strongly compressed into an acute raised median carina posteriorly; mesopleura forming a raised outstanding line separating them from the propodeum. Fourth tarsal joint of front legs, about as long as the first; fifth seen in profile nearly parallel sided for the most part, very little curved on the lower edge, chelar claw with a regular row of distinct spinules (not lamellate) reaching well beyond the middle from the base and with a very distinct anteapical tooth. This genus is a derivative of some such winged form as I have called *Neodryinus,* the thorax becoming modified, as in the other wingless forms included in *Gonatopus s. l.*

Apterodryinus torvus n. sp.

Black, the front of the scape and the mandibles except the teeth, white; the clypeus round the margins, sometimes a mark above this, usually a broad line along the inner orbits, which bears dense silvery pubescence, yellowish or brownish yellow; apical two joints of antennae generally clear testaceous or yellow, sometimes only the apical joint pale, sometimes one or more of those preceding the two apical ones are pale, though generally more or less sordid, but the three last may be concolorous. Tarsi brown, rarely dark brown, stalk of anterior trochanters sometimes pale, posterior femora sometimes with the thin apical part except at the tip yellow, sometimes obscurely pale, or entirely black.

Head moderately strongly transverse, evidently concave above between the eyes, very densely evenly punctate, or shagreened, antennae decidedly slenderer in some examples than in others, in one, carefully measured, the third joint was one and two-thirds the length of the fourth, the latter rather more than three times as long as its greatest width. Pronotum sculptured like the head, smooth in front of the middle about its lateral margins; propodeum in profile strongly rounded, but not at all abruptly raised,

generally smoother, and sometimes shining, on the disc, clothed with scanty, short, pale hairs, finely transversely rugose in front, at the sides, and posteriorly, the wrinkles stronger and more extended in some examples than in others. Front trochanters with a longish thin stalk, chelar claw slender, nearly parallel-sided, moderately curved. The lamellate denticles of the fifth tarsal joint beneath form two rows closely set together. Abdomen polished and very sparsely hairy, except the declivous basal part which is very finely rugulose, and bears more abundant grey pubescence. Length 4-4.5 mm.

HAB. Nogales, Arizona; on weeds in September; two specimens were bred in Honolulu from larvae obtained by Mr. Koebele and sent me in cocoons. The vials containing them were numbered 2511 and 2481. Under the latter number and from the same host, Koebele himself bred male and female of *Hesperodrynius arizonicus,* the host being the same. The species is no doubt parasitic on various Poecilopterine Fulgorids having been bred from *Mistharnophantia sonorana* and the Issid, *Amphiscepa immaculata.*

Chalcogonatopus Perk.

When I characterized this genus in Bulletin I, p. 46, I knew only three Australian and one American species and formed a subgenus (*Eugonatopus*) for the latter. The generic characters there given require slight alteration, as in some of the species now described the head is not concave above, and there are some intermediate forms between *Chalcogonatopus* proper and its subgenus, so that the latter is no longer necessary.

In the table of species *C. perdebilis* is omitted, as the specimens were overlooked until after it had been completed, but the following diagnosis will distinguish it from any other: Testaceous, abdominal petiole black, hind femora variegate, being paler on the thin than on the basal thick part, the tips darkened; fifth tarsal joint beneath with a short row of denticles, which occupies only about half the length between the articular cavity and the terminal hook; size small 2.5-3.25 mm.

Tables of species of *Chalcogonatopus.*

1 (22) Pronotum in dorsal aspect very conspicuously divided into a transverse anterior, and an elevated longer posterior lobe; in profile the dorsal outline is consequently very irregular in nearly all the species.

2 (3) Abdomen with very conspicuous clothing of decumbent silvery hairs ..... *C. argyrias.*

3 (2) Abdomen at most with very sparse clothing of short inconspicuous hairs; or if the hairs are long and conspicuous, they are erect.

4 (11) Trochanters very long and with a thin basal stalk, at least nearly as long as the thickened apical part.

5 (6) Pronotum very distinctly emarginate in the middle of its anterior margin ..... *C. leptias.*

6 (5) Pronotum not distinctly emarginate in front.

7 (8) Head and pronotum largely black or very dark in color ..... *C. paraleptias.*

8 (7) Head and pronotum bright brown or ferruginous.

9 (10) Front femora and tibiae clear testaceous. . *C. euprepes.*

10 (9) Front femora and tibiae mostly pitchy. . *C. euprepoides.*

11 (4) Trochanters not very long, dilating from, or close to, the base, so that there is no long slender basal stalk.

12 (13) Whole insect with clothing of fine, long, erect, pale hairs, those on the middle and hind femora and tibiae long like the thoracic hair..... *C. rapax.*

13 (12) Whole insect not so clothed, the middle and hind femora and tibiae with at most very short and generally inconspicuous hairs.

14 (19) Posterior femora concolorous, except that the tips are sometimes dark.

15 (16) Fifth tarsal joint beneath with only a very short row of elongate hyaline lamellar denticles, this row beginning beyond the middle of the length of the joint from its base ..... *C. frequens.*

16 (15) Fifth tarsal joint beneath with row of lamellate denticles very long and reaching to, or almost to, the articular concavity.

17 (18) Head scarcely concave above, very dull, and excessively densely sculptured, third joint of antennae only about twice as long as the second; propodeum and abdomen reddish ..... *C. solitarius.*

18 (17) Head very distinctly concave above, sculpture indistinct, nearly effaced, third antennal joint more than twice as long as the second; propodeum and abdomen black ..... *C. echo.*

19 (14) Posterior femora with the apical thin part conspicuously pallid (as compared with the basal incrassate part) being pale yellow or whitish.

20 (21) Vertex of head dull, appearing very densely, minutely punctate or shagreened all over .....*C. herbarum.*

21 (20) Vertex shining, almost smooth.....*C. xestocephalus.*

22 (1) Pronotum in dorsal aspect not conspicuously divided into a transverse anterior and an elevated posterior lobe, at most with a feeble or obsolete impressed line dividing these; in strict lateral view the dorsal outline is at most only faintly indented at that point, or in some species it even forms a regular curve throughout.

23 (24) Posterior femora darkened at tips; 6 apical joints of antennae dark, black or blackish.....*C. unicus.*

24 (23) Posterior femora not dark at tips; antennae not colored as above.

25 (26) Antennae pale, joints 7 and 8 dark, the two apical ones clear yellowish-testaceous .....*C. koebelei.*

26 (25) Antennae pale, but with the four apical joints black, or suffused with black .....*C. simulator.*

1. *Chalcogonatopus leptias* sp. nov.

Black, the mandibles except the teeth, the face below the antennae, a line along the inner orbits above these, and the scape in front, yellow. The antennae, except the apical three joints and sometimes more or less of the one preceding these, which are black, clear yellowish testaceous. Front legs with the apex of the coxae, the trochanters, apex of femora, tibiae and tarsi yellow or brownish yellow, some parts being darker than others, the femora dark brown or piceous; middle femora, tibiae and tarsi yellow, or in parts light brownish yellow, the incrassate part of the femora dark, their extreme tips slightly darkened.

Head strongly concave above, smoother and more shining in front of the anterior ocellus, behind which it is quite dull, with densely roughened surface. Antennae quite slender, the third joint one and a half times the length of the fourth, the latter nearly six times as long as its width at apex. Pronotum with well marked transverse furrow, the front division smooth and shining, distinctly emarginate in the middle in front, the posterior division very densely punctate; mesonotal constriction narrow, longer than wide, densely sculptured and with a tendency to a median carination; propodeum distinctly pilose, narrow, elongate-ovate, smooth and shining on the disc, finely transversely rugose posteriorly. Front legs very slender and elongate, as compared with *C. frequens* and others, the femora being relatively much less strongly

dilated basally, trochanters very long, having a long thin basal part, about as long as the stouter apical half; first and fourth tarsal joints not differing much in length, the chelae very long and slender; the fifth tarsal joint beneath with long rows of lamellate denticles, the denticles becoming longer and more distant from one another towards the articulation of the claw; in lateral aspect the sides of this joint are almost parallel, and nearly straight, except of course at the modified apex; chelar claw curved on its apical third, its lower edge on basal part slightly curved. Abdomen dull, clothed with sparse white hairs, the surface having a very minute and close, longitudinal rugulosity. Length 3.5—4.5 mm.

HAB. Nogales, Arizona; on weeds and grass in August.

2. *Chalcogonatopus paraleptias* sp. nov.

Form and general appearance that of *C. leptias,* the legs and chelae being similar. The clypeus however is only pale round the edges, the antennae have the fifth and sixth joints clear yellow, the two or three following these sordid or obscurely yellowish, the fourth also more or less sordidly pale, scape and second joint dark brown above, the third black. The anterior margin of the pronotum is not distinctly emarginate in the middle, it is more or less pale at the sides, as also is the mesonotal constriction; the front femora and tibiae are dark, black or nearly so, and the first two tarsal joints are dark pitchy. The hind and middle femora are black or pitchy on the dilated part, yellow on the slender apical portion, but the tip of this is conspicuously dark in the hind legs; the tibiae are brown, the tarsi clear pale brownish yellow.

HAB. Nogales, Arizona; on oak in August.

3. *Chalcogonatopus cuprepes* sp. nov.

A narrow slender species like *C. leptias* and *paraleptias* in form, the front legs very long, the trochanters with long basal stalk, and the chelae as in those species.

Head, pronotum and mesonotal constriction bright brown; mandibles except the teeth, the front of the scape, and a line on the inner orbits, yellowish-white, the latter covered with glittering silver hairs. Antennae clear yellow, the three apical joints infuscate, the last being the blackest. Front legs clear testaceous, the trochanters paler, the basal joint of the tarsi (excepting its apex) alone dark; middle legs similarly coloured, but the coxae

with a dark spot outwardly, the femora with a dark line above on the dilated portion; hind legs like middle, but the tips of the femora distinctly darker than the pale preceding part, tibiae somewhat darkened at base and apex.

Head deeply concave, more shining and smoother in front of the anterior ocellus than behind; third antennal joint one and two-thirds the length of the fourth, the latter five times as long as its apical width, or rather more. Front lobe of pronotum not noticeably emarginate in front, smooth and shining, except at the sides, the posterior lobe duller, minutely and closely punctured, smoother posteriorly; propodeum sparsely and shortly pilose, in front and at the sides and posteriorly dull, and with fine transverse wrinkles, but with a smooth and shining area on the disc. Abdomen dull, the surface with excessively fine longitudinal rugulose sculpture, and bearing some sparse, short, pale hairs. Length 4 mm.

HAB. Nogales, Arizona; a single example was taken off oak on Sept. 2nd, 1906.

Var. a. Like the type in structure but the fifth, sixth, and seventh joints of the antennae are only very sordidly yellowish, while the prothorax at the sides, and the mesonotal constriction, are more conspicuously yellowish. This individual is larger than the type. Length 4-5 mm.

HAB. Nogales, Arizona; taken on oak, Aug. 1906.

4. *Chalcogonatopus cuprepoides* sp. nov.

Same form and structure as the preceding, of which it might be a variety. It differs however too greatly in colour to be considered identical unless connecting links be found.

Scape of antennae dark posteriorly, third joint also more or less sordid except at base and apex, following three joints clear yellow, seventh somewhat sordid, the three following dark, but more or less yellow-tinged. Front coxae with a dark spot, the front femora and tibiae dark brown, or piceous behind or above, as also the whole of the basal tarsal joint, a dark line on the chelar process of the fifth tarsal joint above near the extremity. Middle and hind legs with the coxae black, except the extreme apices; the thickened part of femora and their apices, the hind tibiae for the most part, and the base of the middle ones all dark. Otherwise the colouration is like that of the preceding. Length 3.5 mm.

HAB. Nogales, Arizona; one example on oak.

5. *Chalcogonatopus argyrias* sp. nov.

Yellowish-brown or ferruginous, the abdomen and four apical joints of the antennae black. Slender apical part of all the femora pallid yellow; base of middle and hind tibiae widely blackish, the apices of the latter widely brownish, darker than the middle part.

Head long and concave on the vertex, its length in dorsal aspect along the middle line about equal to that of a line drawn from eye-margin to eye-margin through the front ocellus, and as long as one and a half times the distance between the eyes at the extreme front of the vertex; in front of the anterior ocellus the surface is manifestly smoother than posteriorly, and is less duli. Third joint of antennae equal to one and two-thirds of the fourth, the latter four times the length of its apical width. Pronotum with distinct transverse furrow, the surface for the most part not much shining, being finely and feebly punctured; mesonotal constriction narrow and elongate, the propodeum distinctly pilose, finely punctured and more or less shining on the disc, posteriorly (and at the sides more or less) transversely rugose. Legs with only short hairs, the front ones long and slender, but the thin stalk of the trochanters is less elongate than in the four preceding species, though it is distinct; first and fourth tarsal joints subequal, fifth beneath with a row of close-set regular denticles beginning at only about the middle of the length of the whole joint from its articulating cavity; between the latter and the series of denticles only some setae and one or two isolated denticles not belonging to that series are present. The abdomen is dull with dense surface sculpture and bears also large feebly impressed punctures. It is conspicuously clothed with appressed silvery hairs. Length about 3.5 mm.

HAB. Nogales, Arizona; on weeds in September.

6. *Chalcogonatopus rapax* sp. nov.

Head, prothorax and mesothorax ferruginous, the abdomen and propodeum black, the latter reddish on the disc in front; scape of antennae in front, and the mandibles except the teeth, which are reddish, yellow, side-pieces of the pronotum with black border above, the anterior margin of the pronotum black in the middle. Front legs ferruginous, the femora and tibiae being more or less obscured in parts, the basal tarsal joint darker than these, the following joints clearer and more yellow. Middle and hind tibiae blackish, the femora dark above, but yellowish

brown or ferruginous below, the tarsi clear yellowish-testaceous, with the basal joint darker brown.

Antennae long and slender, slightly longer than the whole thorax, all the joints elongate, the very long third joint being one and two-thirds the length of the fourth, the latter above five times as long as wide, the penultimate joint fully twice as long as its greatest width; only the scape pale-coloured. Head conspicuously concave above, dull, with excessively dense minute punctuation; raised median line extending forward from the front ocellus, distinct. Pronotum with very minute close punctures, the transverse sulcature deep, the anterior of the two divisions so formed, not half as long as the posterior one; mesonotal constriction slender, elongate, about twice as long as its greatest width, densely minutely punctate or shagreened, posteriorly with some fine transverse wrinkles; the whole thorax with conspicuous, scattered, erect, pale hairs. Front legs with the basal and fourth tarsal joints nearly equal, chelae of the usual type of Jassid parasites, the lamellate denticles of fifth tarsal joint well-developed nearly reaching the articular cavity; the claw moderately curved with some widely separated, pointed denticles projecting from the median groove between the ridges. All the legs are conspicuously, but not densely, clothed with pale erect hairs. Abdomen very dull, impunctate, clothed with longish erect sparse hairs like those on the thorax. Length 5·5 mm.

HAB. Nogales, Arizona; larva pupated from parasitized Jassid nymph on willow 14.IX.06; bred 26.XI.06; number 2480.

7. *Chalcogonatopus frequens* sp. nov.

Ferruginous, the apical abdominal segments sometimes darker brown or blackish, posterior and intermediate femora concolorous throughout, not black apically, antennae more or less pale on the basal joints, the first three generally yellow, but sometimes only the second is distinctly yellow, the scape and third joint being brown, the fourth and following may also be obscurely yellowish, the apical joints being black. Abdominal petiole always black.

Head dull, with close minute puncturation, the antennae slender and of moderate length, no joint being transverse, the third joint one and two-thirds the length of the fourth, the penultimate one and a half times as long as its width. Pronotum smooth and shining, with very sparse, short, erect hairs in fresh examples, mesonotal constriction longer than broad, propodeum

variable in sculpture, dull and with close sculpture very distinct in some, in others with the surface smoother and shining, posteriorly with some excessively fine transverse wrinkles. The surface is always pilose, the hairs being short, sparse and fine, but erect or suberect. Front legs with the first and fourth tarsal joints not differing much in length, the chelar claw very strongly curved; row of lamellate denticles of fifth tarsal joint occupying only a short ridge, which begins about the middle of the length of the joint from the articulation of the claw, and is not one-third of the whole length of the joint beneath; outside there is a row of a few shorter and stouter teeth, variable in number, one or two of which are placed nearer to the articulating cavity, while starting from the apex of this cavity there is a sharp raised ridge. As usual, setae are present in addition to the denticles, and there is the usual cluster of the latter on the curved tip. Abdomen smooth and shining. Length 2.5—4 mm.

This species varies considerably in size as the above measurements show. The depth of colour also varies. In sculpture it does not vary much, except that the propodeum is distinctly shining in some examples, dull in others, and there are intermediate conditions. The form and armature of the chelae is alike in specimens exhibiting the above variations.

HAB. Nogales, Arizona; a fine series was captured on weeds at the end of August and in September.

8. *Chalcogonatopus solitarius* sp. nov.

Dull, reddish brown, the several apical joints of the antennae black, the three basal joints clear ferruginous, the two or three following more or less obscurely pale; abdominal petiole black; basal joint of front tarsi concolorous with the tibiae or almost so; posterior femora concolorous (at most a little darker at extreme apex), their apical part not being pale yellow.

Head very little concave above, the eyes not very strongly convergent towards the front, dull, with excessively dense and fine rough sculpture, which under the microscope appears to be formed of a mixture of rugulosity and the usual dense punctuation. Antennae shortish, the third joint equal to one and a half times the length of the fourth, the latter subequal to the second, and hardly more than twice as long as wide at apex: penultimate joint scarcely longer than wide. Pronotum dull and closely punctate in front of the transverse furrow, and also immediately behind this, where is a somewhat flattened area, the posterior lobe being broader than in most species, and smooth and shining

on its posterior part; mesonotal constriction short, as wide or wider than long; propodeum shortly pilose, as is the pronotum, dull, with dense minute puncturation or surface sculpture, posteriorly transversely rugose, a very faint median impressed line on the disc. Front legs stout, the femora very strongly dilated, the trochanters dilating from the base and so without a distinct basal stalk. Abdomen with sparse pale hairs, the apical margins of the segments paler than the ground color. Length 4 mm.

HAB. Nogales, Arizona; one female collected from weeds in September.

9. *Chalcogonatopus echo* sp. nov.

Head, pronotum and legs ferruginous or testaceous, two basal and more or less of the third joint of the antennae yellow, rest of thorax and abdomen black, pronotum more or less darkened at the sides, posterior tibiae darker apically.

Head moderately, but distinctly, concave above, the surface hardly shining, the sculpture being extremely minute; antennae long and slender, all the joints elongate, the third one and two-thirds the length of the fourth, the latter being about four times as long as its apical width. Thorax long and slender, formed much as in *C. rapax*, and with sparse, pale, erect hairs; the pronotum densely and finely punctured, somewhat shining in front of the transverse sulcature, the propodeum quite dull and very densely and evenly sculptured, with only a few fine transverse wrinkles just above the base of the abdomen. Front legs very similar throughout to those of *C. rapax* (but clothed with only a few short and inconspicuous hairs) the trochanters dilating from close to the base and without a long thin stalk and the chelae also similar. Abdomen with scattered erect hairs, in some aspects the surface having a slightly metallic lustre. Length 4 mm.

HAB. Nogales, Arizona; collected on weeds in September.

10. *Chalcogonatopus herbarum* sp. nov.

Yellowish-red to brownish or dark red, the abdominal petiole black, four to six of the basal joints of the antennae, usually ferruginous or yellowish, the fourth, fifth and sixth generally dark above, sometimes all but the basal two joints are dark, though in this case the third to the fifth are usually more or less reddish-tinged at least beneath. Middle and hind femora with

a pale yellow or whitish band between the middle and the apex, which is black or dark, the apices of the tibiae also dark.

Head distinctly, but not strongly, concave above, dull, with excessively minute close sculpture. Antennae moderately long all the joints being elongate, the penultimate being at least one and a half times as long as its greatest width, the third joint one and two-thirds the length of the fourth. The pronotum is smooth and shining, but is punctate, the transverse division very distinct, the mesonotal constriction moderately elongate. There are a few short hairs on the thorax above, and the usual long ones just behind the mesothoracic constriction beneath. The propodeum is dull, with very fine sculpture on the disc near the spiracles, the whole posterior surface regularly transversely rugose, the wrinkles finer in some examples than in others, and in front of the spiracles and laterally the surface is also rugose. Legs formed as in *C. frequens* and others, at most with very short and inconspicuous hairs; first and fifth tarsal joints of front legs subequal, or with the latter slightly the longer, the lamellate denticles in a long row, the trochanters with short basal stalk. Abdomen shining, smooth, with hardly perceptible sculpture. Length 4-5 mm.

HAB. Nogales, Arizona; a series of specimens taken on weeds in August and September.

11. *Chalcogonatopus xestocephalus* sp. nov.

Extremely like *C. herbarum*, the chelae being similarly formed, the lamellate denticles reaching to, or almost to, the basal articulating cavity of the fifth joint beneath. The legs have a similar pattern, the thin apical part of the femora being conspicuously paler (whitish yellow) than the basal part, and with dark tips; the posterior tibiae also darkened at the apex. Trochanters of front legs dilating from close to the base, there being no long thin stalk.

Head, thorax, legs (except as noted above) and the base of the abdomen behind the petiole brown, in some parts darker in some more yellowish; mandibles except teeth, and the scape beneath pale yellow. Four basal antennal joints ferruginous or testaceous, the fourth more or less darkened, the following also obscurely pale, the apical joints black. Abdomen except near the base black. Head slightly concave, with the sculpture of the surface so feeble that it is shining, and bears also some sparse and excessively feeble punctures. Pronotum smooth and polished

above, but at the sides, especially posteriorly, it is dull and densely sculptured. Propodeum with a faint impressed median line on the disc, where the surface is dull, or at least very little shining, posteriorly and at the sides it is very conspicuously transversely rugose; it is distinctly pilose, though the hairs are short and sparse. Abdomen smooth and shining, with very sparse pale hairs, most noticeable on the basal declivous portion, the punctures very remote and feeble, but some of them rather large; behind the petiole the abdomen is brown at the base, and the apical margins of its intermediate segments and the compressed apex, are more or less obscurely ferruginous. Length 4 mm.

HAB. Nogales, Arizona; one female on weeds in September.

12. *Chalcogonatopus unicus* sp. nov.

Ferruginous, the six apical joints of the antennae black, or nearly so, the one preceding these obscurely pale, the rest pale, the two basal joints being clearer than the third. Apices of middle and hind femora and of the tibiae blackish, basal joint of anterior tarsi dark brown. Petiole of abdomen black.

Head distinctly concave above, very dull, the sculpture, which may be considered as either a very dense fine puncturation, or a close microscopic reticulation of the surface, very even throughout the vertex and front. Antennae longer than those of *C. solitarius,* the third joint being much more than twice as long as the second, the fourth rather more than three times as long as wide at the apex. Pronotum punctate in front, pubescent, more shining posteriorly, transverse furrow very feeble, obsolescent, so that in lateral aspect, the outline of the pronotum is not much interrupted thereby, the posterior lobe also being somewhat compressed into a subcarinate form; propodeum dull, pilose, densely and finely punctulate on the disc, posteriorly with a few very fine transverse wrinkles. Lamellate denticles of fifth tarsal joint of front legs reaching to the articulatory cavity, the trochanters dilating from close to the base, so that there is no distinct slender basal stalk. Abdomen with sparse pale hairs, the surface dull or hardly shining, its sculpture being quite distinct, though extremely fine, in addition to which sparse feeble punctures are easily seen. Length about 4 mm.

HAB. Nogales, Arizona; a single example taken on weeds in September.

13. *Chalcogonatopus simulator* sp. nov.

Ferruginous, abdominal petiole, four apical joints of the antennae, and the mandibular teeth black or dark.

Head dull, appearing very densely and minutely punctate, or shagreened; third joint of antennae nearly four times as long as the second, the fourth about four times as long as its greatest width. Pronotum not or hardly at all shining, but minutely and closely punctured, the posterior part very little raised, the transverse division being obsolete; propodeum very dull, sparsely but distinctly pilose, very densely punctate or granulated on the disc; posteriorly with distinct transverse wrinkles. Chelar claw extremely strongly curved, its lower edge strongly curved towards the base, first and fourth joints of front tarsi not differing much in length. Abdomen smooth and shining along the apical margins of the segments, duller and closely sculptured elsewhere on the intermediate segments, clothed with very sparse pale hairs. Length 5-5.5 mm.

This species is allied to the following, *C. koebelei,* with which in most respects it agrees in structure. It is easily distinguished by its smaller size, differently colored antennae and by the propodeum being more strongly rounded above, as seen in profile, rising up more strongly from the mesonotal constriction.

HAB. Nogales, Arizona; collected on weeds in September.

14. *Chalcogonatopus koebelei,* sp. nov.

Ferruginous, seventh and eighth joints of antennae, black or suffused with blackish, the sixth also generally more or less suffused; abdominal petiole black; teeth of mandibles dark red or brown. Thin portion of femora concolorous with the basal dilated part.

Head strongly concave above, dull or almost so, with very dense minute puncturation or granular appearance; third antennal joint four times the length of the second; penultimate joint elongate, about twice as long as wide. Pronotum simple, no trace of a transverse impressed line or furrow, densely sculptured like the head in front, but posteriorly smoother and more shining; mesonotal constriction and propodeum with similar dense sculpture and dull, the latter very long-ovate, the sides gradually narrowing in front to the width of the mesonotal constriction; the whole thorax sparsely but distinctly pilose. Front trochanters dilating from close to the base, so that there is no elongate basal

stalk, first and fourth tarsal joints subequal; fifth with two long rows of lamellate denticles beneath, of which, as in various other species, one row extends further back than the other, its denticles nearly reaching the articular cavity, towards which they are set more widely apart from one another; the other row shorter. Chelar claw very strongly curved. Legs thinly pilose, the hairs on the posterior tibiae as long as these are thick. Abdomen shining and smoother along the apical margins of the intermediate segments, which elsewhere are densely minutely sculptured, and bear also some feeble largish punctures, from which the sparse hairs spring. Length 6 mm.

Hab. Nogales, Arizona; in August on oak.

15. *Chalcogonatopus perdebilis* sp. nov.

Testaceous, the abdominal petiole black, the antennae yellow or testaceous, but towards the apex they become more or less smoky, even strongly so in some specimens. Hind and middle femora distinctly variegate, paler on the thin apical part than on the basal, and the extreme tips darkened.

Head not very strongly transverse, deeply concave, and with the surface smooth and shining, the space between the eyes anteriorly much shorter than the length of the head along the median dorsal line. Antennae with the fourth joint longer than the second, and three or more times longer than its greatest width. Pronotum behind the transverse groove closely punctate or sculptured, and not shining, the mesonotal constriction dull, elongate; the propodeum more or less shining on the disc, posteriorly rugose, and with some short hairs. Front legs with the first and fourth joints of the tarsi not differing much in length, the fifth beneath with a short row of lamellate denticles occupying about half the length of the underside of the joint between the articular cavity and the terminal curved portion or hook, the denticle nearest the articular cavity much the longest, chelar claw slender, moderately curved. Abdomen shining and smooth. Length 2.5-3.2 mm.

This description is mainly drawn up from the type specimen. Of the several examples seen none seem quite identical in sculpture, form, etc., and it is possible that there is more than one species before me. One of these appears to have longer antennae and legs, the front trochanters with longer and thinner stalk and two minute projecting angles just behind the mesonotal constriction. The propodeum may be little, or not at all, shining.

The material is not sufficient for an understanding of the limits between variation and specific distinction.

HAB. Nogales, Arizona; collected from weeds in September.

Eucamptonyx gen. nov.

General form as in Gonatopus; mandibles with four teeth, maxillary palpi 6-jointed, labial 3-jointed; pronotum with strong transverse constriction; front trochanters long, with basal thin stalk, chelar claw nearly straight and parallel-sided for most of its length, towards the apex suddenly and strongly bent, this bent part flattened, beneath armed with well-developed lamellate denticles, but without an anteapical tooth.

Not related to *Apterodryinus,* but rather to *Agonatopoides,* which has only 5-jointed maxillary palpi and the chelar claw normal for a parasite on Delphacids.

Eucamptonyx testaceus sp. nov.

Testaceous or ferruginous, the head being darker than the abdomen and legs, the abdominal petiole black, the apical six joints of the antennae being infuscate or sordid on the left side, but much less so on the right in the unique specimen.

Head above very strongly transverse, twice as wide as long in the middle, the eyes extremely wide apart in front, the surface dull, very densely punctate, distinctly concave. Antennae slender, the third joint about one and a half times the length of the fourth, the latter four times as long as its apical width or rather more. Front lobe of pronotum shining, the posterior one subcarinate, densely sculptured like the head, the mesonotal constriction elongate, the propodeum very strongly rounded above, smooth or hardly sculptured on the disc, finely transversely rugose behind; front legs with the fourth tarsal joint subequal to the first, or not much shorter, fifth with the lamellate denticles not nearly reaching the articular concavity, the chelar claw with four or five lamellate denticles. Abdomen smooth, but scarcely shining, with hardly visible surface sculpture even under a very strong lens. Length nearly 4 mm.

HAB. Nogales, Arizona; a single specimen taken on weeds in August.

Agonatopus gen. nov.

Distinguished from *Chalcogonatopus* by having only five joints to the maxillary palpi, two before and three beyond the geniculation.

Table of species of *Agonatopus*.

1 (8) Pronotum with strong constriction, dividing it into two lobes, the posterior not compressed, cariniform.
2 (5) Lamellate denticles of fifth joint of front tarsi beneath not reaching back to the articular cavity.
3 (4) Abdomen ferruginous or testaceous..*A. pallidicornis.*
4 (3) Abdomen mostly black..*A. pallidicornis* var. *dubiosus.*
5 (2) Lamellate denticles of front tarsi almost reaching the articular cavity of the fifth joint beneath.
6 (7) Insect almost wholly ferruginous....*A. ferrugineus.*
7 (6) Insect largely dark brown and black..*A. piceseens.*
8 (1) Pronotum compressed into a median carina on the posterior part, which is only faintly separated from the anterior .....*A. heterothorax.*

A. innitidus was bred after the construction of this table, where it would be placed with *A. pallidicornis* var. *dubiosus*, from which the dull abdomen would at once separate it.

1. *Agonatopus pallidicornis* sp. nov.

Yellowish-brown or testaceous, the abdominal petiole black, tips of the front femora, the thin part of the hind and intermediate ones pale yellow, the tips of the two latter being slightly, but noticeably, darkened. Mandibles yellow, the teeth dark, reddish or brown. Antennae concolorous or almost so, sometimes subinfuscate apically, but never black. Head distinctly concave, long above, not at all strongly transverse, compared with many other forms, the inner margin of the eyes strongly convergent anteriorly, the surface shining, the sculpture being extremely feeble. Antennae with the third joint rather less than twice the length of the fourth, the latter about four times as long as its greatest width. Pronotum with strong transverse constriction; behind which it is very smooth and shining; mesonotal constriction dull, longish; propodeum elongate, almost evenly curved above in profile, the sculpture on the disc very fine, the surface in some examples being somewhat shining there, but not

always; posteriorly, transversely rugose, the hairs very sparse, in some examples only one or two being visible, but these are no doubt more or less abraded. Anterior legs with the basal thin stalk of the trochanters not long, basal and fourth tarsal joint not differing much in length, the lamellate denticles on the fifth joint beneath not nearly reaching the articular cavity, the denticle nearest to this being twice the size of those at the other end of the row, but the setae, which are fine and long, extend back to the cavity. Abdomen nearly smooth, bearing a very few short hairs, and some excessively faint, obsolete punctures. Length 4-4.5 mm.

Agonatopus pallidicornis var. *dubiosus.*

Like a small example of the above in structure, the third and apical joint of the antennae being somewhat darkened or infuscate, the abdomen shining black, pale only immediately behind the petiole, and on the compressed apical segment. Length 3 mm.

HAB. Nogales, Arizona; on weeds in September.

2. *Agonatopus ferrugineus* sp. nov.

In form and color like *A. pallidicornis,* but readily distinguished by the black apical joints of the antennae, of which the first two joints are always and the third usually, entirely pale, while one or two of the following may be concolorous with these. Front tarsi generally more or less dark or infuscate, the basal joint being usually largely or entirely pale. The head appears to vary in intensity of sculpture, but this is not strong enough to prevent the surface being somewhat shining, at least in most examples. Structurally this species may be at once separated from the preceding by the armature of the chelae, the fifth tarsal joint having its lamellate denticles reaching nearly to the articulatory cavity, the head is decidedly more transverse, and in fresh specimens the propodeum is probably more pilose, but easily abraded. The sculpture of the latter seems to vary similarly in each species. Length 4-5 mm.

HAB. Nogales, Arizona; on weeds and grass in August and September.

3. *Agonatopus piceseens* sp. nov.

Like the preceding in structure, but differs greatly in color. Head dark brown, pronotum and mesonotal constriction paler

than the head, propodeum black, red-tinged on the disc. Abdomen black, brownish just behind the petiole and on the compressed apical segment. Legs dark-brown or pitchy, but the tarsi for the most part and the trochanters, the front tibiae inwardly, the middle of the posterior and intermediate tibiae are paler, yellowish or testaceous. Mandibles, except the teeth, the thin part of the hind and middle femora, except the dark apices, pale yellow. Two basal joints of antennae yellowish brown, but the scape is darker above, the third also brownish, the rest black. Length 4 mm.

This will probably prove to be an extreme color variety of the preceding and there will be intermediate conditions in coloration. I can see no structural distinction.

HAB. Nogales, Arizona; on grass in August.

4. *Agonatopus innitidus* sp. nov.

Testaceous, the abdomen black, as also the antennae except the basal joint and the second, the latter partly infuscate; front tarsi to a large extent sordid; propodeum brownish, darker than the pronotum, tips of the front and middle femora white, the posterior ones widely white at apex, middle and hind tibiae black at base, and the latter also at the extreme apex.

A slender species, the head not strongly transverse, dull, with excessively fine close sculpture, hardly visible; antennae slender, the second joint elongate, as long as the fourth, the third much longer than these, the eighth about twice as long as wide. Whole thorax appearing densely punctate, from the nature of the surface sculpture, mesonotal constriction long and slender, the mesopleura well separated from the other elements of the thorax, the propodeum strongly and nearly evenly rounded above when viewed in profile, and clothed with sparse pubescence. Front legs with the trochanters long, and with long thin basal stalk, first and fourth tarsal joints subequal; lamellae of fifth joint extending throughout its length to the articulating cavity beneath, chelar claw slender and lightly curved. Abdomen dull, coriaceous, or microscopically shagreened, bearing sparse short pale hairs. Length 2.5 mm.

HAB. Nogales, Arizona; larva on a very small Jassid found on grass (the larval sac on abdomen, and very large), pupated on the first of October (Koebele under No. 2506); parasite emerged in Honolulu on March 3rd, 1907. The species is very distinct from anything else in the genus by its color combined

with the sculpture of the abdomen. The maxillary palpi have the three terminal joints unusually short.

5. *Agonatopus heterothorax* sp. nov.

Black, the three basal joints of the antennae brown, the second paler, the scape whitish in front. Clypeus and mandibles (except the teeth) testaceous or yellowish, the former dark on the disc. Pronotum along the sides, and the front coxae beneath, brownish. The legs are largely dark colored, or nearly black, the anterior femora and the thin part of the middle and hind ones more brownish-pitchy, as also the hind tibiae in the middle, the tarsi of middle and hind legs mostly paler, sordid yellowish, the chelar claw yellow. Abdomen brownish-tinged near the base.

Head moderately strongly transverse, lightly concave above, dull with the appearance of very dense puncturation or shagreening, due to excessively dense reticulate surface rugulosity, as seen under high powers of the microscope. Mesonotal constriction and propodeum similarly sculptured and dull. Third antennal joint equal to the fourth and fifth together, the fourth about two and a half times the length of its greatest width. Pronotum ovate, well rounded in front and at the sides, the transverse impressed line hardly visible, in front of this line sculptured like the head, as also at the sides, but shining in the middle behind it, where it is compressed and cariniform. Head and thorax with short pale pubescence, the propodeum posteriorly with very little evidence of transverse wrinkles. Front trochanters short and stout, dilating at once from the base, the femora very robust, first and fourth tarsal joints subequal, the fifth beneath with very long row of close-set hyaline lamellate denticles, which reach to to articular cavity and convergent with these towards the free extremity of the joint is a second row of about 7 or 8 stronger and more hyaline denticles, which are set wide apart from one another. Chelar claw moderately curved, with the usual armature of Jassid parasites. Abdomen dull, with very minute reticulate rugulosity of the surface, pilose, and with very faint, sparse punctures. Length about 4 mm.

This species has no relationship with any of the preceding, and will, no doubt, subsequently be separated generically.

HAB. Nogales, Arizona; a single female was bred in Honolulu on January 17th, 1907 from a cocoon obtained from a large dark Jassid nymph found on grass, the larval sac being placed on the underside of the abdomen (2495).

Agonatopoides gen. nov.

General form of *Gonatopus,* the labial palpi three-jointed, the maxillary palpi five-jointed, there being three joints beyond the geniculation, front legs with chelae armed for catching Fulgorids, the chelar claw having well-developed lamellate denticles, and a minute but distinct tooth near the apex.

Agonatopoides synchromus sp. nov.

Ferruginous or testaceous, the abdominal petiole black, the antennae infuscate after the two basal joints, those towards the apex more yellow-tinged than the intermediate ones.

Head concave between the eyes, the surface nearly smooth and somewhat shining, the sculpture being very indistinct. Antennae slender, the third joint about twice as long as the fourth, which is more than three times as long as its greatest width at the apex. Pronotum with fine close puncturation or sculpture, which is not very definite; mesonotal constriction dull and narrow; the propodeum long-ovate, its upper edge in profile very slightly curved, till it is rounded off at the posterior declivous portion, in no wise rising at all abruptly from the mesonotum. The sculpture on the disc is very fine and in some examples evanescent, posteriorly there are very fine transverse wrinkles and few or no hairs are present. The abdomen is hardly visibly sculptured. Trochanters of front legs rather long and slender, there being a distinct, thin basal stalk, the first tarsal joint is as long or rather longer than the fourth, the fifth has two rows of convergent lamellate denticles, those nearest the articular cavity being the longest, and not far distant from the cavity; chelar claw with six or eight denticles. Length 4 mm.

HAB. Nogales, Arizona; collected on weeds and bred (2473) from a Delphacid, *Cochise apachcanus,* nymph and adult, found on grass.

Neogonatopus Perk.

1 (2) Chelar claw with a tooth near the apex....*N. mimus.*
2 (1) Chelar claw without such a tooth.....*N. mimoides.*

1. *Neogonatopus mimus* sp. nov.

Ferruginous or testaceous, abdominal petiole black, abdomen often darker than the thorax or brown, the first two and usually

the third joint of the antennae altogether or for the most part, clear testaceous, the rest black or nearly so; mandibular teeth dark.

Head strongly transverse, distinctly impressed along the middle line; in front of the ocelli smooth and shining, but behind these dull and with dense minute sculpture; antennae shortish and stout, the fourth joint being only as long as the second and hardly twice as long as its greatest width at apex, the third joint rather more than one and a half times the length of the fourth. Pronotum shining, smooth or almost so, the lobes very distinctly divided, mesonotal constriction dull and rather short, propodeum very feebly sculptured on the disc and sometimes dull, but usually more or less shining, posteriorly transversely rugose, with short and very sparse erect hairs. Front legs with the chelar claw with a minute tooth close to the apex beneath, the trochanters dilating from close to the base; fourth tarsal joint shorter than the first, the fifth with the modified free extremity much less hooked than is usual in Jassid parasites, the lamellate denticles not reaching back to the articular cavity but towards this replaced by bristles. Abdomen nearly smooth, with scattered hairs. Length 2.5-3 mm.

This species, resembling in color so many others of allied genera from Arizona, is distinguished by the sculpture of the head, the short antennae and the chelae. The latter more nearly resemble those of a Fulgorid parasite than is the case in any species known to me of the Gonatopus s. l. group. However, even had it not been bred, it would have been placed, as certainly a Jassid parasite, by any one familiar with the various forms of the chelae.

HAB. Nogales, Arizona; collected on weeds and bred from Jassids (numbers 2448 and 2448-b.).

2. *Neogonatopus mimoides* sp. nov.

Ferruginous or testaceous, the petiole black, the mandibles pale yellow with dark teeth. Thin part of posterior and middle femora distinctly paler than the dilated basal part, the tips darkened. Antennae with the three basal joints pale, the rest black or nearly so. Except for the slightly variegated color of the legs almost like the preceding, but more slender and elongate and very distinct by many points of structure.

Head not very strongly transverse, the eyes much closer together in front than those of *N. mimus,* distinctly concave, and

the surface smooth and shining, with at most a very indefinite sculpture. Antennae slender and longer than in *N. mimus*, the fourth joint longer than the second, and about three times as long as its greatest width, the third one and two-thirds the length of the fourth. Pronotum with well-marked transverse constriction, shining, very minutely punctate, or sculptured, and with sparse short hairs; mesonotal constriction longish, the sides forming an almost regular outline with those of the propodeum, the latter narrow, in no wise strongly or abruptly raised in front of the spiracles, closely and minutely punctured or shagreened on the disc, posteriorly transversely rugulose, sparsely pilose. Front trochanters dilating from close to the base, the first and fourth tarsal joints subequal, the fifth with long row of lamellate denticles beneath, chelar claw moderately curved, of the usual structure of Jassid parasites, there being no anteapical tooth. Abdomen smooth, shining, sparsely, but distinctly, pilose. Length 3 mm.

HAB. Nogales, Arizona; on weeds in September.

Gonatopus Ljung.

The single species described differs from those I have examined from Europe and Australia in the simple, undivided pronotum.

Gonatopus haplothorax sp. nov.

Testaceous or ferruginous, the abdominal petiole black, the abdominal segments with some pale yellow or whitish bands or maculae, rarely absent. Antennae with 3-5 basal joints pale, the apical ones being black. Legs not variegate.

Head rather strongly transverse, somewhat concave, being more deeply impressed in the middle, nearly smooth and shining in front of the ocelli, but posteriorly dull and minutely and densely punctured. Antennae longish, fourth joint much longer than the second, about four times as long as its apical width. Pronotum simply convex, not transversely divided, finely punctured and subpubescent in front, posteriorly smoother and shining. Propodeum long, ovate, narrowing gradually into the mesonotal constriction, in profile rising gently from this and not at all abrupt, densely minutely sculptured and with quite evident, but short, white pubescence. Front trochanters stout, thickened from the base; lamellate denticles in a long even row on the

lower edge of the fifth joint of tarsi, and reaching to, or almost to, the articulating cavity, chelar claw moderately curved. Abdomen smooth, not or hardly sculptured, in fresh specimens with sparse pale hairs. Length about 3 mm.

One example has no evident pale markings on the abdomen, but probably this is chiefly due to post mortem changes of color. The above species will, I suspect, be subsequently and properly separated from *Gonatopus,* as a distinct genus, but as in some of the allied genera intermediate conditions between a simple and a transversely divided pronotum are found, for the present it may be associated with the Jassid parasites, that have a five-jointed maxillary and two-jointed labial palpus. Length 3.5 mm.

HAB. Nogales, Arizona; collected from weeds in August and September.

Pseudogonatopus Perk.

1 (2) General color black .....*P. autoxenobius.*
2 (1) Testaceous, the abdominal petiole black. .*P. arizonicus.*

1. *Pseudogonatopus arizonicus* sp. nov.

Testaceous or ferruginous, abdomen sometimes brownish, the petiole black, the apical seven joints of the antennae darkly infuscate or blackish, mandibular teeth dark.

Head distinctly concave above, narrow between the eyes anteriorly, the distance between their margins anteriorly being much less than the length of the head dorsally along the middle line, the surface nearly smooth and more or less shining, but duller and more sculptured behind the line of the ocelli; antennae quite distinctly clavate, the fourth joint rather longer than the second and more than three times as long as its greatest width, the third being about one and two-thirds the length of the fourth. Pronotum distinctly transversely divided, on the posterior part closely and finely punctured, mesonotal constriction longish, behind which the thorax is strongly widened; propodeum strongly convex, rising quite abruptly from the mesonotum, as seen in profile, very densely and finely sculptured, dull or almost so, transversely rugulose posteriorly, without pilosity; front trochanters long and rather slender, first tarsal joint somewhat longer than the fourth, the fifth with the usual two rows of lamellate denticles, convergent towards the tip, the one row longer than the other, chelar claw with only about four denticles, and

with a distinct tooth near the apex. Abdomen nearly smooth and very sparsely pilose. Length 2.5-3 mm.

HAB. Nogales, Arizona; bred from nymph and adult of the Delphacid (*Stobaera* sp?) numbers 2475 and 2452.

2. *Pseudogonatopus autoxenobius* sp. nov.

Black, face yellow or brownish yellow, occiput also brown, as also the pronotum, more or less, posteriorly; two basal joints of antennae pale, abdomen more or less brown in parts, at least apically and near the base; the femora are black or pitchy, the thin part of the middle and hind ones pale, tibiae brown, varying in depth of colour in different parts, tarsi paler, yellowish; the trochanters are pale, the front ones slightly embrowned, the front coxae light brown with a dark mark.

Head very strongly transverse, densely punctate or shagreened, strongly concave, the antennae slender, the fourth joint much longer than the second, about four times as long as its greatest width, the third more than one and a half times the length of the fourth. Pronotum strongly divided transversely, densely punctate or shagreened, considerably more strongly sculptured than the head, the mesonotal constriction elongate, behind which is a sutural transverse line; the propodeum dull, very densely sculptured all over, appearing punctate or shagreened, posteriorly also transversely wrinkled, and without hairs. Anterior trochanters with a longish basal stalk, which is, however, not very well marked, fourth tarsal joint long, but less so than the first, lamellate denticles of fifth in two long and dense rows, of which one reaches to the articular cavity, the chelar claw with four or five lameliate denticles and a distinct anteapical tooth. Abdomen smooth, without sculpture, but not very shining. Length with abdomen extended 4.5 mm.

HAB. Nogales, Arizona; bred from the same Delphacid, an adult, (*Stobaera* sp.) as the preceding; number 2463.

Neodryinus.

I have retained this name for the present in my table of genera, though it may be synonymous with *Dryinus,* of which I have not a satisfactory description, nor any authentic European examples for comparison. It is certain that *Dryinus ormenidis* Ashm. comes very near to my *Neodryinus,* but in that species, if the thorax be viewed from in front, the position of the parapsides is

distinguishable, though the furrows are almost effaced. In *Neodryinus* proper there is no trace of these furrows. The very remarkable habit of the larva of *Neodryinus* in covering its cocoon with the ruptured larval sac, which it removes from the leafhopper, is not found in any other genus of Dryinidae, nor does it occur in the case of *D. ormenidis*. To the Australian species of *Neodryinus*, I now add two new species from Arizona. One of these was bred, and its cocoon greatly resembles those of the Australian species, as also does the mature insect. *Dryinus alticola* and *D. maculicornis* of Cameron, from Central America, are, I suspect, closely allied to these Arizona species.

1. *Neodryinus arizonicus* sp. nov.

Black, the hind and middle tarsi, the fourth, fifth and more or less of the apical part of third joint of the antennae, clear testaceous or ferruginous; scape of antennae dark fuscous, yellowish beneath. Front femora inwardly with a rufescent line on the apical part and continued throughout the length of the tibiae. Front tarsi more or less brown, the chelar claw whitish. Wings pale at the extreme base, then with a wide transverse smoky band, reaching apically to the transverse median vein, a second oblique fascia or spot reaches about half across the wing, arising beneath the apical half of the stigma.

Head strongly transverse, hardly concave on the vertex, the ocelli in a triangle with the basal side widest, the surface dull, or almost so, and with a fine, close reticulation of wrinkles. Antennae with the third joint almost twice as long as the fourth, the latter about four times as long as its greatest width. Pronotum with a strongly raised posterior portion, in front of which the sculpture consists of very fine and close oblique striae on each side. Mesonotum more longitudinally rugose, but not regularly; propodeum with stronger longitudinal wrinkles, but more or less connected transversely so as to form reticulation. Lamellae of fifth tarsal joint elongate, closely set together, and reaching, or almost reaching, the articulatory cavity, the chelar claw curved, not armed with lamellate denticles, but with at most a few bristles, and a small angle or obscure tooth close to the apex. Abdomen smooth, shining, impunctate. Length 4—5 mm.

HAB. Nogales, Arizona; bred (no. 2450) from nymphs of *Ormenis septentrionalis* on Oak.

2. *Neodryinus dubiosus* sp. nov.

This may be a variety of the preceding, and possibly will be found to be parasitic on another species of Fulgorid. It differs from *N. arizonicus* in having the first, third, fourth and fifth joints of the antennae ferruginous, the sixth is also partly reddish, the small second joint being dark brown. The front femora are more extensively reddish brown, the tibiae almost entirely so, the middle femora are reddish at the tips, the posterior ones more widely so, the base of the hind tibiae being of the same colour. The reticulate rugosity of the head is stronger and the surface appears to be rather more shining.

HAB. Nogales, Arizona; a single female was captured on an oak tree in August.

Paradryinus Perk.

The species here described agrees, on the whole, with the Australian species in its generic characters.

Paradryinus mexicanus sp. nov.

Ferruginous, the head of a rather redder colour than the abdomen, legs, &c.; mesonotum, propodeum and mesopleura black, as also the abdomen on its apical half or more and the petiole; middle and hind tibiae, and the hind femora inwardly, brownish; apex of abdomen ferruginous.

Head convex on the vertex, seen from in front the hind margin almost straightly transverse, dull, with very dense puncturation or shagreening; antennae with very slender third joint, which is about one and a three-quarters the length of the fourth; the latter about seven times as long as wide, the following being somewhat wider than this. Pronotum rather strongly rounded laterally, compressed at the sides posteriorly, transversely constricted at the apex, raised on its hinder portion, but not strongly; the surface is dull, the sculpture excessively fine, hardly visible under a strong lens, and much finer than that of the head. Mesonotum dull, except the polished neck, which may be concealed beneath the pronotum, the surface very minutely shagreened, the parapsidal furrows fine, slightly convergent posteriorly almost reaching the hind margin; propodeum very densely reticulately rugose. Wings with an infuscation in the basal cells, extending a little beyond the transverse median vein apically, and a second one

originating beneath the stigma and in the radial cell and forming a transverse fascia. First joint of front tarsi very long about twice as long as the elongated fourth, second very small, third larger than this but still small, the fourth being much longer than the preceding two together. Abdomen smooth and without definite sculpture. Length 4 mm.

HAB. Mexico (? Pazcuaro).

Hesperodryinus gen. nov.

This new genus is proposed for three slender and elongate species, evidently allied to *Paradryinus*. All are of a ferruginous or testaceous colour, with short, but functional, wings, which are banded. The head is of peculiar form, being acutely wedge-shaped posteriorly, the hind margin when the head lies back, resting over a considerable part of the pronotum and entirely concealing the prolongation of the prothorax in front of the pronotum. Consequently, when seen from in front, the hind margin of the head is well rounded and extended far back behind the eyes, the posterior ocelli being placed well behind an imaginary line joining the hind margins of the eyes. In *Paradryinus*, when the head is viewed from in front, the hind margin is nearly straightly transverse and the posterior ocelli generally about on a line with the hind margin of the eyes. The pronotum is strongly compressed at the sides posteriorly, so that it is there bluntly cariniform, its sculpture and that of the head is very dense and minute, the surface being quite dull. Otherwise the genus greatly resembles *Paradryinus*, the maxillary palpi with four long joints beyond the geniculation, the two basal ones, as usual, less distinctly divided, the basal apparently less chitinized and perhaps more or less fused to the maxilla. Labial palpi three-jointed, the apical one very long and cylindrical. The front legs are formed much as in *Paradryinus*, but are rather stouter; the second joint of the tarsus is very small, the third much longer, but still much shorter than the fourth; the chelar claw of one species differs remarkably in structure from that of the others; the lamellate denticles of the fourth joint are well developed and reach or nearly reach back to the articular cavity.

The males of two species are known, and these may be easily distinguished from those of *Paradryinus* by the eyes having comparatively few and short hairs, hardly noticeable under a strong lens, and by the much less conspicuously hairy antennae. In both species the femora and tibiae are black, while in all the

known males of *Paradryinus* the legs are ferruginous or testaceous. Type of genus *H. arizonicus*.

Table of species of *Hesperodryinus*.

1 (2) Chelar claw in lateral view nearly parallel sided, hardly curved except at the tip, near which is a distinct prominent tooth ..... *H. amphiscepae*.
2 (1) Chelar claw well curved, and without a tooth near the apex.
3 (4) Propodeum rather finely reticulately rugose about the middle dorsally, on each side of this with minute shagreening or surface sculpture...*H. arizonicus*.
4 (3) Propodeum with strong longitudinal wrinkles all over its upper surface ..... *H. audax*.

1. *Hesperodryinus amphiscepae* sp. nov.

Ferruginous, abdominal petiole black, the apical segments often more or less infuscate. Three basal joints of antennae concolorous with the head, the fourth and fifth white or whitish with a dark line, or the usually dark part may be concolorous with the preceding joints, following joints dark or sordid, the apical one usually paler.

Head dull, excessively finely and closely sculptured; second joint of antennae about half as long as the fourth, the third twice as long as the latter, dull and microscopically sculptured like the head, without any transverse division, but strongly compressed at the sides so as to be bluntly cariniform on its posterior half or two-thirds. Mesonotum more or less finely and sometimes vaguely longitudinally rugose, the surface minutely granulate or coriaceous, the parapsidal furrows easily seen when the thorax is viewed from in front; scutellum minutely punctate or shagreened; propodeum reticulately rugose, but at the sides with dense minute surface sculpture only, about as long as the mesonotum and the two scutella together. Front trochanters short and stout, lamellae of fifth tarsal joint in a long line extending to, or nearly to, the articulating cavity; this line of denticles appears to consist of two rows or more, which are more or less confused; chelar claw with the denticles more spinose, and set further apart, the anteapical tooth distinct. Abdomen smooth, without any definite sculpture. Neuration mostly pale, yellowish, the transverse nervures being more or less dark, and with a dark transverse cloud along them, a second transverse cloud extends across the wing

from about the middle of the stigma, but fades out before the tip, stigma yellowish or fuscous, white on the basal part. Length 4-6 mm.

Male black, the front tibiae rufescent, the extreme tips of all the femora also pale, basal joint of middle and hind tarsi and the second more or less, white. Head, mesonotum, and scutellum all similarly sculptured, and pubescent, the sculpture appearing as a dense rugosity or rugose puncturation; scape of antennae about as long as the fourth joint, the second ovate, the third rather more than one and a half times the length of the fourth, and fully three times as long as wide. Towards the apex of the antennae the joints become gradually more slender. Parapsidal furrows indistinct, but, if examined from the front, they can be traced as converging lines to the hind-margin of the mesonotum, where they are still widely separated; propodeum strongly rugose. Wings with the stigma blackish fuscous, the radius angulated before the middle and reaching only about half way from its base to the tip of the wing. Abdomen ovate, very finely punctured, and clothed with short hairs, basal segment angularly bent about the middle, its basal face impressed. Length 3 mm.

HAB. Nogales, Arizona; collected on grass and bred from nymphs of *Amphiscepa bivittata*. The larval sac is placed beneath the tegmen or wing; number 2446.

2. *Hesperodryinus arizonicus* sp. nov.

Colour, form, size and for the most part the sculpture, as in the preceding species, fourth and fifth antennal joints entirely white or with a dark line, the antennae no doubt varying in colour, as they do in *H. amphiscepae;* propodeum with loose reticulate rugosity about the middle of the dorsum. Chelae quite unlike those of *H. amphiscepae,* the fifth joint with a curved edge beneath, bearing the lamellate denticles, the chelar claw well and almost evenly curved, its lower edge on the basal half somewhat serrate and with a few spinose bristles and with no trace of a tooth near the apex.

HAB. Nogales, Arizona; bred from the nymphs of *Mistharnophantia sonorana;* the larval sac is black and placed beneath the wing or tegmen. I cannot certainly decide whether the males under the number 2481, belong to this species wholly or in part, or to the preceding. They do not agree altogether in details amongst themselves and the possibility of either species of the parasite attacking both of the hosts is so great, that the male I

have assigned to *H. amphiscepae* may really belong to *H. arizonicus*.

3. *Hesperodryinus audax* sp. nov.

Colour, form, and sculpture generally, almost as in the preceding two species. This is, however, of larger size, the third antennal joint is black, pale only at the tip; the mesonotum is regularly and closely longitudinally rugose, the propodeum is also strongly longitudinally wrinkled, with very little reticulation, at least on the dorsal surface. Chelae formed and armed almost as in *H. arizonicus;* just beyond the most apical of the spinose bristles there is a slight elevation of the lower edge of the chelar claw, hardly to be considered as a tooth. Length 8 mm.

HAB. Nogales, Arizona; one example was captured on an oak tree.

Perodryinus gen. nov.

General form and structure of *Paradryinus,* but with the front tarsi very different. The basal joint is long and slender, as long as the four following together, the second small, the third and fourth subequal, the backward process of the fifth reaching to the base of the fourth, and densely armed with lamellate denticles; the chelar claw a simple spine with dilated base for articulation, the chelae being extremely short. Pronotum longer than the mesonotum, compressed posteriorly, but without a transverse division; mesonotum without parapsidal furrows, with dense rugose-punctate or reticulate sculpture.

Male like that of *Paradryinus* but the eyes are bare, there are no parapsidal furrows, the radius is short, falls far short of the wing margin, and is bent at about its middle.

Perodryinus amoenus sp. nov.

Black, antennae, the clypeus, the pronotum and the legs ferruginous, the antennae subinfuscate apically. The mandibles except the teeth, the basal half of the posterior tibiae, the basal joint more or less of the middle and hind tarsi, whitish; tips of hind femora black.

Head and mesonotum very densely rugose-punctate or reticulate; third antennal joint long, twice as long as the fourth. Pronotum rugulose and with pale pubescence; scutellum rather smoother than the mesonotum, the propodeum shining, reticulate-

rugose, much less closely sculptured than the mesonotum, posteriorly with a raised line or carina on each side of the middle. Wings clear hyaline, stigma yellow at base, dark fuscous on apical part, costal and sub-costal nervures dark, as also the transverse ones, the latter subinfuscate, and a rather narrow infuscate band crosses the wing from about the middle of the stigma. Abdomen glabrous and shining, the whole thorax having short grey pubescence. Length 4 mm.

Male black, the two basal joints of the antennae, the front and middle legs except the coxae, yellowish brown or testaceous. Hind tibiae pale on basal half, the tarsi still paler. Antennae attenuated towards the apex, the third joint about one and a half times the length of the fourth, the joints (except as previously noted) blackish, but tinged with yellow. Thorax sculptured like the same parts in the female, the abdomen shining, very finely indefinitely punctured, and impressed at the base. Wings hyaline, costal, sub-costal and radial veins dark, stigma dark fuscous except at base. Length 3 mm.

HAB. Nogales, Arizona; bred from nymphs of *Amphiscepa bivittata*. The number attached is 2426, clearly an error, for 2446, under which number it is mentioned that two parasites were bred, viz.: the present one and *Hesperodryinus amphiscepae*. The larval sac, placed beneath the wing, is variegate, dark fuscous and yellowish.

Eukoebeleia Perk.

This name is practically a duplication of *Eukoebelea* already in use. I do not think it advisable to suggest any substitute at present, because I have some doubt whether the genus is not synonymous with *Bocchus* of Ashmead. As, however, the characters of the mouth-parts, as given for *Bocchus,* are quite different from those of my two species of *Eukoebeleia,* and further the description of the tarsal generic characters does not agree, while Dr. Ashmead's characterization is confirmed by Brues, I must consider the two genera distinct. The fact that the following species is fully winged will require some modification of the original generic characters, as given by me.

Eukoebeleia arizonica sp. nov.

Generally like *E. mirabilis,* the tarsal structure similar, but the wings are well-developed and there is an infuscate transverse fascia, narrowed below, placed beneath the radial vein.

Black, the trochanters, the front tibiae and all the tarsi pale, yellowish brown to testaceous. Two basal joints of antennae clear yellowish (the apical joint is wanting in the example described). Mandibles yellowish, the teeth dark, the inner one considerably smaller than the two well-developed outer ones. Legs except as above described, pitchy to black, the middle and front femora being lighter than the hind ones.

Head and thorax very densely and evenly shagreened, dull, the scutellum more shining, the propodeum distinctly areolated, and the surface rugose. Abdomen ovate, very smooth and polished.

The sculpture of this species is almost as in *E. mirabilis,* the dense surface sculpture of head and mesonotum giving them the appearance of being closely and evenly punctured. The raised lines on the propodeum are stronger in *E. arizonica,* and the areolation therefore more definite. The postscutellum is as feebly developed in the winged as in the subapterous species. Length 3 mm.

HAB. Nogales, Arizona; one female collected on weeds in September. Many parasitized *Bruchomorpha* were found on grass in this locality, at the same time, but from the cocoons obtained (no. 2483) no adults have as yet emerged.

Deinodryinus gen. nov.

Head and thorax of large size, much more robust than the abdomen; head greatly produced behind the eyes, the sides there being convergent, the vertex strongly and straightly margined; ocelli in an equilateral triangle or almost so, and placed far in front of the posterior margin, distant from it by more than the length of the triangle that they form; vertex slightly convex or at least not at all impressed; mandibles with four strong teeth; maxillary palpi six-jointed, labial three-jointed, third antennal joint at least one and a half times the length of the fourth. Pronotum elongate, hardly rounded at sides, transversely impressed in front, its lateral posterior angles attaining the tegulae; mesonotum and scutellum together about as long as the pronotum, the former with deep, subconvergent parapsidal furrows, which fail before reaching the hind margin; propodeum moderately long, not at all areolated. Front legs with extremely stout femora, the first tarsal joint rather short, much shorter than the fourth, the second minute, transverse, the third much longer than this and not very much shorter than the first, the fifth very long and slender. Chelae well developed, freely extensible, row of lamellate

denticles of fifth tarsal joint long, the chelar claw simply curved, with oblique grooves on each side of its lower edge, and without any subapical tooth, the whole being evidently adapted for catching Jassids. Stigma of front wings long, narrowly ovate, radius bent or angulate near the middle, where the (almost obliterated) transverse cubitus would originate. In the two species known the wings are bifasciate.

The male in this genus is very different superficially, being much smaller, black, with clear wings, but in many respects resembles the female. The head is more transverse, less produced behind the eyes, but otherwise rather similar, the ocelli being remote from the hind margin. The pronotum is as usual not or hardly visible in dorsal aspect and there are the other usual sexual differences. The most important characters appear to be the bare eyes, and the clothing of the antennae, these bearing long curved hairs, several times as long as the width of the elongate joints, the hairs tending to form whorls. The scape is clothed like the following joints, but the hairs on the apical ones become shorter, and the tenth joint has quite short ones. The posterior ocelli are distant, each from the nearest eye-margin by a space greater than that which lies between them. The mesonotal parapsides are like those of the female.

This is a remarkable genus and appears to me to be intermediate in character between the sections of Dryinidae with large ovate stigma and those with a narrow elongate one. It is, however, to be associated with the former section and comes near to *Chelogynus*.

Table of Species.

1 (2) Head in front densely and more or less rugulosely punctured . . . . . *D. paradoxus*

2 (1) Head in front for the most part with fine sparse punctures . . . . . *D. quercicola*

1. *Deinodryinus paradoxus* sp. nov.

Ferruginous, extreme base of abdomen black, apical two or three joints of the antennae black or blackish, and one or two of the preceding joints sometimes subinfuscate.

Head with feebly impressed, coarse, rugose punctures on the vertex, between the antennae and the front ocellus the sculpture is finer and dense, more or less rugulosely punctate. Third joint of antennae one and a half times the length of the fourth or

rather more, the latter three or more times as long as wide, fifth wider than the fourth, but of nearly equal length. Pronotum irregularly punctured, the punctures of unequal size; mesonotum smooth and shining, very sparsely punctured, the suture between it and the almost or quite impunctate scutellum, deep and consute; propodeum finely transversely rugose, pilose, and subimpressed medially on its posterior portion. Legs shortly, but distinctly, pilose; the tarsi pallid; wings distinctly, but not deeply bifasciate, the stigma yellow. Abdomen smooth and polished, impunctate or almost so. Length about 5 mm.

Male black, the antennae, clypeus for the most part, mandibles except the teeth, antennae, front and middle tibiae testaceous or ferruginous, apical joint of antennae more or less black, the tarsi pale, whitish. Head coarsely rugose-punctate, pilose like the thorax; the antennae with all the joints elongate and for the most part not differing much in length, the apical joint acuminate and one and a half times the length of the preceding, the third four times as long as broad. Mesonotum and scutellum shining, sparsely punctured, propodeum short, irregularly rugose, or with close reticulation. Wings hyaline, stigma blackish. Abdomen small and narrow, subclavate. Length about 4 mm.

HAB. Nogales, Arizona; collected on oak and cocoons obtained in August and September; the female bred in October (2466). I bred male and female (under the same number) in Honolulu at the end of February from cocoons obtained in September at Nogales. It is parasitic on a large green Jassid on Oak.

2. *Deinodryinus quercicola* sp. nov.

Form, size and colour like that of the preceding species, from which it is easily distinguished by the colour of the antennae, the fourth to the tenth joints being dark, black or blackish, though the more basal of these are yellow- tinged, the third joint is also more or less infuscate. The extreme apex of the middle tibiae, the extreme base and apex of the hind ones, and the extreme base of the hind tarsi, are dark.

The general sculpture is for the most part like that of *D. paradoxus*, but that of the head is quite different, since its surface is smooth with only very fine and scattered punctures, and in nowise rugose. Only for a very short space, immediately above the antennae, is the sculpture dense and somewhat as in the preceding species.

HAB. Nogales, Arizona; a single example was captured beneath an oak tree in September.

Chelogynus Hal.

Neochelogynus of Bull. I is synonymous with this, as a comparison of European species shows, and the characters of the mouth parts are as described by me under that name. It is at once separable from *Anteon* by the partially extensile chelae and the different position of the articulation of the fourth and fifth tarsal joints, to which this mobility is due. *Chelogynus* at present includes insects with great differences in structure and will unquestionably be itself broken up.

Table of Species described.

1	(2)	Apical joint only of the antennae dark.....*C. lusus.*
2	(1)	More than one antennal joint dark.
3	(4)	Coxae mostly dark, pronotum with some transverse rugulosity . . . .*C. funestus.*
4	(3)	Coxae altogether pale . .....*C. melanacrias*

1. *Chelogynus funestus* sp. nov.

Black, the basal joints (usually about four) of the antennae ferruginous, the apical ones black. Some of the basal joints may be more or less darkened, the number of those that are red is not constant and the red often gradually merge into the dark apical ones. The front femora are sometimes pale, but may be nearly black, the middle and hind ones are generally black or at least pitchy-brown, and their tibiae are also dark, but noticeably pale on the basal part to a greater or less extent; hind coxae always black or dark, except that the extreme apex may be pale. Mandibles yellow, the teeth dark; neuration yellow, stigma dark fuscous.

Head and face quite dull, very densely and minutely shagreened or rugulose, the antennae with the flagellum subclavate, the scape about as long as the three following joints together, second joint subequal to third, which is slightly longer than the fourth, the fifth decidedly wider than the preceding, but none of the flagellar joints are transverse. Pronotum with some extremely fine transverse rugulosity; the mesonotum more or less shining, at least never dull like the head, and with at most a few

very shallow punctures; scutellum shining and smooth, propodeum truncate, rugose, the truncation bounded by a raised line, posteriorly densely minutely shagreened and without any definite area. Fifth tarsal joint with well-developed lamellate denticles in two rows and with series of long setae at the side, chelar claw with long seta on the subbasal angle beneath. Abdomen smooth and shining. Length 2-5 mm.

Male black, anterior tibiae and tarsi testaceous, the middle and hind tarsi also more or less pale or brown, otherwise the legs nearly wholly black. Neuration brown, stigma dark brown or blackish fuscous. Head sculptured as in the female, and with faint traces of feeble punctures; antennae as long as the head and thorax, the scape fully as long as the two next joints, which do not differ much in length, the flagellum being submoniliform, with the joints nearly similar, clothed with hairs not shorter than their width; none of the joints are as wide as long. Mesonotum more shining than the head, with very feeble surface sculpture and traces of hardly visible punctures, scutellum polished; propodeum as in the female. Abdomen smooth and polished. Length 2 mm.

HAB. Tucson, Arizona; bred from nymphs of a Jassid found on a small bush (no. 2420) and probably the same species, with the legs paler generally, the posterior femora brown with black apices, was bred (no. 2461) and captured at Nogales. Mr. Koebele's note states that the host and probably the parasite from Nogales are the same as his Tucson specimens. The variation is considerable, and the description of the male and female is primarily based on two specimens bred from one individual of the hopper.

2. *Chelogynus melanacrias* sp. nov.

Black, mandibles (except the teeth) whitish, antennae clear testaceous on the basal joints, the four apical ones being black (at least above) one or two of those preceding these generally subinfuscate. Legs concolorous with the basal antennal joints, even the coxae entirely pale, the tips of the tarsi and the apices of the hind femora black or dark fuscous, the apical part of the hind tibiae sometimes infuscate.

Head dull, densely and minutely shagreened, the antennae with the second, third and fourth joints differing very little in length, the third being a little longer than the fourth, the fifth and following wider than the latter, the seventh rather longer than its greatest width. Pronotum somewhat transversely rugulose anteriorly,

the mesonotum less densely sculptured and less dull than the head, and with only very feeble sparse punctures; scutellum polished; propodeum rugose before the truncation, posteriorly dull, with very dense and fine close rugulosity and generally some fine transverse wrinkles, but without any defined area. Lamellate denticles of chelae much as in the preceding. Stigma blackish fuscous, otherwise the neuration pale, except the radius. Abdomen smooth and shining. Length 2-2.5 mm.

HAB. Nogales, Arizona; captured on weeds in September.

3. *Chelogynus lusus* sp. nov.

Black, the mandibles (except the teeth) whitish, the antennae except the apical joint concolorous and testaceous, legs concolorous with these, but the hind femora are to a large extent black or blackish (the base being paler) and the apical part of the hind tibiae is also dark.

Head dull, densely minutely shagreened and with sparse traces of obsolete punctures. Antennae formed much as in the preceding, the apical joint alone dark. Pronotum very densely sculptured like the head, and dull, and I cannot detect any trace of the transverse rugulosity observable in the two preceding species. Mesonotum dull with very fine surface sculpture, and a few nearly effaced punctures; scutellum polished; propodeum as in the preceding. Stigma blackish fuscous, radius also dark, otherwise the nervures are pallid. Chelae much as in the preceding. Abdomen smooth and shining. Length 2 mm.

HAB. Tucson, Arizona; bred from the same species of hopper and at the same time as *C. funestus*, of which it might be a sport, but the colour characters are very different and the sculpture also differs (no. 2420).

Anteon Jur.

The single species, which I refer to this genus, is congeneric with examples I have examined from Germany, having a similar structure of the chelae, and my *Prosanteon* from Australia is synonymous with it. In the European, Australian and American species the mouth-parts are as given by me in my characterization of *Prosanteon* in Bulletin I of this Station, and not as given by Ashmead in his Monograph of the Proctotrupidae and later writings. I consider the genus quite distinct from *Chelogynus* on account of the non-extensile chelae, the fourth tarsal joint being

short and articulated to the fifth much further from the apex of the latter.

Antcon arizonensis sp. nov.

Black, the mandibles (except the teeth) yellow, the antennae, except the subinfuscate apical joint, and the legs, testaceous; the middle coxae have a basal dark spot, the hind ones are black except at the apex, the middle femora have a dark line beneath and the posterior ones are dark brown or pitchy except at the extreme base and apex; stigma blackish fuscous, the radius also dark, the rest of nervures pale yellow.

Head shining, closely subrugosely punctured, but sparsely punctate about the ocelli, the antennae with the second and fourth joints subequal, the third considerably longer than the latter, the seventh, eighth and ninth wider than this, and short, being not much longer than wide. Pronotum finely rugulose; the mesonotum polished, with a few punctures in front, the furrows very short; scutellum impunctate; propodeum rugose and bounded posteriorly by a raised line, posteriorly dull and shagreened towards the sides, the median area, defined by very fine raised lines, smoother and somewhat shining. Abdomen smooth and polished. Fifth tarsal joint with fine bristles beneath, those near the articulatory cavity longest, the other extremity of the joint having short spinose ones. Length 2.5 mm.

The male of this species is smaller, under 2 mm. long, black, with whitish mandibles, the front and middle tibiae and tarsi testaceous, the rest of the legs to a large extent blackish or sordid, the knee-joints of the hind legs noticeably pale. The antennae have the basal four joints black, after which they shade into testaceous, the apical joints being clear or almost so.

Head somewhat shining, with somewhat coarse and indefinite puncturation, vaguely channeled in front of the anterior ocellus; scape of antennae about equal to the two following joints together, the second ovate, but longer than wide, about as long as those following, which do not differ much in length, the whole being somewhat moniliform-filiform, the hairs somewhat curved and in general about as long as the width of the joints. Mesonotum shining, with punctures like those of the head, but much more sparse, scutellum and postscutellum polished and impunctate, propodeum closely rugose, posteriorly smoother hardly more than shagreened even at the sides, the median area being defined by very fine lines, but quite observable on careful inspection. Abdomen smooth and polished.

HAB. Nogales, Arizona; bred from a medium sized, rather scarce Jassid nymph, on willow (no. 2467). Mr. Koebele remarks that the parasite is hard to raise.

Aphelopus Dalm.

In a male specimen of this genus dissected by me the maxillary palpi are very long and five-jointed, the first four joints subequally elongate, the second much stouter than the third, the fifth nearly one and a half times the length of the preceding. I cannot detect any division of the long first-joint, such as forms the basal one in *Anteon* and other genera, and the labial palpi are only two-jointed, with the second one elongate-oval and much more developed than the first.

The larval sac of *Aphelopus* is easily distinguished from those of the other Dryinids by its elongate form, which resembles that of Emboleminae, and probably the genus would be better referred to that subfamily, which forms similar sacs on Orthoptera and has simple tarsi, if it be considered distinct from the Dryininae. A yellow Belytid also was bred from similar elongate sacs on Typhlocybines, sent over to me from Germany by Koebele. It is very curious that these small Typhlocybines can be as readily seized and parasitized by the non-chelate *Aphelopus* as by the rather imperfectly chelate *Chelogynus* or the perfectly chelate and highly evoluted *Pachygonatopus*. Many Typhlocybine Jassids were found parasitized by *Aphelopus* in Germany by Koebele, but either the larvae died on the way to Honolulu or the climate of the islands proved fatal, for the cocoons yielded no mature insects. The latter are difficult to sex; in some examples, which are certainly males, the abdomen in dry specimens is so compressed as to be laminate; but this is, I believe, due to post mortem collapse of the abdomen. In others the females are similarly compressed. In one species, of which males and females were both bred, the face of the former is largely white, in the latter black, and in other two species, which from the antennae I judge to be males, the face is conspicuously ornamented with white. Ashmead, however, describes a species in which the white preponderates in the female sex, so that the sexes cannot be determined off-hand by the facial coloration.

Synopsis of species of *Aphelopus*.

1 (2) Head with the mandibles alone white. . . . . .
. . . . . *A. arizonicus* (female)

2 (1) Head with white facial markings.
3 (4) Clypeus alone white ..... *A. microleucus.*
4 (3) More than the clypeus white.
5 (6) White facial markings extending a little above the antennae ..... *A. viduus.*
6 (5) White facial markings extending at least as far as the anterior ocellus, along the eye-margins.
7 (8) Mesonotum entirely black ..... *A. arizonicus* (male)
8 (7) Mesonotum white externally to the parapsidal furrows ..... *A. pulcherrimus*

1. *Aphelopus arizonicus* sp. nov.

Black, the mandibles except the teeth pale yellow, the basal two joints of the antennae yellow or yellowish brown; front and middle legs except the apices of the tarsi, the hind coxae, trochanters, and basal joint of tarsus, testaceous; the hind femora and tibiae black or pitchy; stigma blackish fuscous, the radius curved.

Head and mesonotum dull, densely minutely shagreened, the parapsidal furrows of the latter distinct, strongly convergent posteriorly, visible behind the middle of the mesonotum, but not reaching the posterior margin. Antennae subclavate, the 3rd, 4th and 5th joints slender, elongate and subequal, the seventh, eighth and ninth much wider than these, but none of them as wide as long, apical joint one and a half times the length of the preceding; scutellum decidedly more shining than the mesonotum; propodeum finely reticulately rugose, posteriorly with a large smoother and shining area defined by raised lines. Abdomen smooth and shining. Length 2 mm.

Male like the female in sculpture, but the two basal joints of the antennae are darker brown, the face below is yellow, with the yellow colour continued upwards along the inner orbits to the height of the anterior ocellus, the legs, except the tips of the tarsi, are entirely clear testaceous; the stigma is pallid brown, with darker margin. Antennae more elongate and less noticeably subclavate, the eighth and ninth joints short, hardly twice as long as wide, and shorter than the fourth and fifth. Propodeum not shining posteriorly.

HAB. Nogales, Arizona; bred from a species of *Dikraneura?* (no. 2454).

2. *Aphelopus viduus* sp. nov.

Male, black, the lower part of the face and the mandibles, except the teeth, pale yellow or cream-coloured, this colouring reaching about half way from the mandibles to the anterior ocellus and not being noticeably carried upwards along the inner orbits. Front and middle legs pale yellow, the tarsi for the most part infuscate, the hind femora tibiae and tarsi pitchy.

Head and mesonotum dull, densely shagreened and the latter with the parapsidal furrows distinct and like those of *A. arizonicus*. Antennae long, slender and filiform, the first two joints dark brown or pitchy, but with the extreme base of the scape yellow, third joint rather shorter than the fourth, which is shorter than the fifth, seventh and eighth almost equal, slender, longer than the fourth or fifth and more than twice as long as wide, tenth joint very slender and elongate. Scutellum, at least posteriorly, and the postscutellum smoother than the mesonotum, the propodeum reticulately rugose, a posterior area being defined by raised lines and smoother. Abdomen smooth and shining, stigma dark brown. Length about 2 mm.

HAB. Nogales, Arizona; collected on weeds in September.

3. *Aphelopus pulcherrimus* sp. nov.

Black, the whole face creamy white, this colour reaching almost to the anterior ocellus and at the sides is continued upwards as far as the posterior ocelli along the orbits, the outer orbits being also of the same colour; scape of antennae and all the legs whitish or pale yellow; also the whole of the mesonotum is cream-coloured exteriorly to the parapsidal furrows, and likewise the whole thorax beneath and the pleural portion. Antennae, except the scape, testaceous; wings with brown stigma.

Head and thorax sculptured as in the two preceding species, posterior area of metanotum dull, minutely shagreened. Antennae with the second and third joints shortish, not differing much in length, but the fourth is rather longer than the third, and subequal to the fifth. Abdomen smooth and shining. Length 1.5 mm.

Owing to their delicate nature the antennal joints have more or less collapsed and I cannot exactly make out the true shape of some of them, nor am I certain of the sex of the single example.

HAB. Nogales, Arizona; bred from a species of *Typhlocyba* (*Zygina*) no. 2455.

4. *Aphelopus microleucus* sp. nov.

Male, black, the clypeus and mandibles (except the red teeth) white, the two basal joints of the antennae dark brown or pitchy, all the coxae and trochanters pale yellowish-white or white, the front legs testaceous, but the femora are somewhat sordid and the tarsi except the basal joint infuscate; middle legs (except as above noted) still more darkly sordid and the hind legs almost black; stigma blackish fuscous.

Sculpture of head and mesonotum as in all the preceding, but the parapsidal furrows are effaced; propodeum reticulately rugose, this sculpture extending on to its posterior face also, where, however, there is a small smoother area. Antennae simple, filiform, first three joints subequal, shortish, not much longer than wide, the third on its wide face subtriangular, fourth and following nearly parallel-sided, the fifth, sixth, seventh subequal and longer and more slender than the fourth; seventh and eighth twice as long as wide, or more. Abdomen smooth and shining. Length under 2 mm.

HAB. Nogales, Arizona; bred from a species of *Typhlocyba* (*Zygina*) no. 2456.

ENCYRTIDAE.

A remarkable Encyrtid was bred from larvae feeding internally in the body of a Jassid (*Oncometopia lateralis*) several parasites emerging from the host, which after their emergence lived for a week.

Following Ashmead's classification this species belongs to the tribe Encyrtini and I have felt some doubts whether it might not be referred to Mayr's genus *Prionomastix*, but the frons is so very wide that I have been obliged to consider it as a new one, and it is quite possible that in reality it is not at all allied to the other, which is unknown to me.

Thysanomastix gen. nov.

Head strongly concave behind, the ocelli in a triangle with very wide base, but though so widely separated, the posterior ones are as far removed from the eye-margins as from one another, the frons being very broad. Head in front view widely subtriangular, strongly convex, the antennae inserted high up near the middle, the space between the eye and base of mandible about as long as

the eye, the labrum exposed, the clypeus not defined, there being only an impression or fovea on each side just above the labrum. Mandibles truncate, one of the apical angles being more acute than the other, which is followed by minute microscopic indentation, but there are no true teeth, and the edge under high powers of the microscope is very finely serrulate. Antennae elongate, the scape long, clavate, extending above the vertex by about half its whole length, which is equal to that of the following two or three joints, the pedicel subtriangular about equal to the second joint of funicle, the first funicle joint very long, about five times as long as wide, and with the second clothed on one side with conspicuous erect hairs, which are curved and dilated apically, with acute tips; rest of antennae with inconspicuous subappressed hairs, the third to the sixth joints of the funicle not differing much in length, being barely one-third as long as the first, but wider than this, club not evidently segmented, rather small, subequal to the three preceding joints only. Thorax with the acute tips of the axillae meeting inwardly, the scutellum very convex, compressed, so as to be obscurely carinate in the middle, the propodeum sparsely pilose at the sides. Wings with dark markings, the neuration very difficult to see in part, but the marginal vein is short, the stigmal moderately long, very oblique (i. e. more longitudinal than transverse), the postmarginal as long as the stigmal or a little longer. Hind tibiae apparently with no trace of a second spur, the calcar of the middle legs not so long as the first tarsal joint. Ovipositor not prominent.

Thysanomastix koebelei sp. nov.

Dark brown, inclining to black in parts, antennae except the scape black or nearly so, abdomen also very dark or black, with the faintest trace of metallic tinge in some aspects; the insect generally being not at all metallic.

Head somewhat shining, there being a microscopic surface sculpture and some very feeble fine punctures, most noticeable on the front, about the eyes. Mesonotum slightly shining, clothed with short pale hairs, and having a feeble indefinite puncturation; scutellum with sparse longish hairs at the apex, where it extends over the propodeum, which is smooth and shining on the convex, or somewhat protuberant, sides. Wings mostly hairless on about the basal half; two-thirds from the base of this hyaline portion apically is a narrow transverse dark bar, densely hairy, extending from the submarginal vein, but not touching the costa, nor reach-

ing the opposite margin; apical portion of wing hairy and largely occupied by a large blackish fuscous cloud, the stigmal, marginal and postmarginal veins still blacker, but the postmarginal appears to extend a little beyond this black area. Abdomen as long as the thorax, but much smaller in bulk, shining, depressed above, as is usual in dead Encyrtids, this being a usual post mortem change. Length 1.5 mm.

HAB. Nogales, Arizona; bred, no. 2444.

Saronotum Perk.

This hyperparasite was bred (no. 2448b) from the cocoon of *Neogonatopus mimus* and appears to be almost or quite identical with the Australian form. I am therefore inclined to think that *Saronotum americanum* and *S. australiae* are one species, my original example of the former being merely a variation of the latter. Mr. Koebele captured what might be the male of *Saronotum*. It has longer antennae and only rudimentary wings and differs in other characters, such as are probably only sexual. Other instances of Chalcids that are parasitic on other Hymenoptera having flightless males and fully winged females are known to me, but I should hesitate to describe the specimen in question as a male of *Saronotum* without further evidence.

EULOPHIDAE.

When in Australia, the possibility of the Tetrastichine, *Ootetrastichus beatus,* being hyperparasitic at once suggested itself to us, but the idea was discarded. Later on, breeding of the species in confinement for several generations made it appear certain that it was a primary egg-parasite, and not bred at the expense of the Mymarids. Subsequently Dr. L. O. Howard called my attention to the fact that theoretically it ought to be a hyperparasite. Ashmead has recently described certain Tetrastichines as being parasitic on Mymaridae, but without valid proof of the relationship. Accordingly I carried out some further experiments with *Ootetrastichus beatus,* raising cane-plants indoors in covered glass jars, then introducing leaf-hoppers and finally specimens of the parasite. In the two jars employed, every leaf-hopper egg that was laid in the leaves was destroyed by the *Ootetrastichus.* When young the larva lives within one of the hopper's eggs, like a Mymarid, but later on emerges and destroys the other eggs in the egg-chamber; then usually bores a gallery for some length

in the midrib of the leaf, and pupates at the end of this. Whether the Chalcid would spare or pass by eggs parasitized by the Mymarids is uncertain, but it certainly readily destroys unparasitized eggs of the leaf-hopper.

TRICHOGRAMMIDAE.

Trichogramma helocharae sp. nov.

Yellow, or in life more or less green; head with a black transverse line on the occiput; thorax with slight dark markings, the chief of these in dorsal aspect of the insect being a marginal line on each side in front of the tegulae, a spot on each side just behind them, the front and hind suture of the scutellum more or less, and a spot at the hind angles of the propodeum. The pleura are considerably more infuscate or blackish-marked than the dorsum. Abdominal segments with a dark latero-marginal line more or less distinct. Wings with the marginal vein infuscate and a dark spot (including the stigmal vein) extends from it about half across the wing. Four or five of the hair lines are more distinct than others, those between the more distinct ones being mostly somewhat confused and indefinite, or only short.

Antennae with the scape about equal to the pedicel and funicle together, the pedicel twice as long as the two funicle joints together, the first of the latter longer than the second and sometimes showing signs of transverse division near the base, as if to form a second ring-joint, club longer than the pedicel, ring-joint and funicle joints together. Length .6 mm.

HAB. Alameda, California, and elsewhere in that state; bred from eggs of *Helochara communis,* no. 2440.

STYLOPIDAE (Coleoptera)

In Arizona at Nogales Koebele bred males of *Halictophagus* from three species of leaf-hoppers, of which two belong to the Jassidae and one to the Delphacidae. The parasites themselves are very closely allied to and greatly resemble the Australian (and ? Vitian) *Halictophagus schwarzii,* but can be distinguished by the characters of the genital segments, though these are quite similar in general plan to those of the Australian species. I may note that this is the first time *Halictophagus* has been bred from a Delphacid, the common parasite of which is *Elenchus.* I should add also that since my former paper on the Stylopidae was writ-

ten, I have found the latter genus to freely attack arboreal Delphacids as well as the graminivorous species. The species found most numerously stylopized in Arizona was *Oncometopia lateralis* in the nymphal stages (no. 2445); the second Jassid affected by *Halictophagus* was *Ceratagallia bigeloviae* no. 2522; the Delphacid that yielded the parasite is a species of *Stobaera* no. 2523.

EPIPYROPIDAE (Lepidoptera)

Mr. Koebele found *Epipyrops barberiana* Dyar very commonly in Arizona affecting Issine, Amphiscepine, and Poecilopterine leaf-hoppers. This species differs very greatly in neuration from the Australian forms, though like them superficially. In the hind wings, veins 1a, 1b and 1c are well developed and veins 2-8 are all present. In the Australian genera one of the veins 2-8 is always absent and of these forms only *Palaeopsyche* has all the veins from 1-12 in the forewings. The cocoon of this moth is very similar to those of some Australian species, and has similar erect processes or lamellae on the dorsum, these processes being variable in number or form, as in the others.

PIPUNCULIDAE (Diptera)

In Arizona at Nogales a parasitized Jassid (no. 2469) was found, from which a *Pipunculus* larva emerged and pupated on the twenty-ninth of September and yielded the fly on the twenty-ninth of October. It is a large species, quite resembling the Australian species of Div. I (Bull. I. p. 130) in all characters, except that the third antennal joint is hardly perceptibly produced at the apex, though somewhat pointed there. A second species of *Pipunculus* (female) quite distinct from this and belonging to my Section II of the Australian species was bred from *Amphisceta bivittata*, no. 2447. It differs from any of these in having the third antennal joint only slightly produced at the apex, though acute. Koebele also procured other puparia of Pipunculidae, but from these no flies have emerged. In my introductory remarks, I have already recorded the breeding in Honolulu of the European *Verrallia aucta* and *villosa* from German puparia, as well as species of *Pipunculus*, all from Jassids. Koebele found the latter very common in meadows in Germany and many species were obtained.

HEMIPTERA HOMOPTERA.

By G. W. Kirkaldy.

The few Hemiptera discussed in the following pages were collected merely on account of their being the hosts of certain parasites and were indeed not always in the best condition for describing, being parasitized by Dryinidae, and often dried up.

The thirteen specimens belong to twelve species, eleven genera, and five families. Two genera and seven species are apparently new to science.

The species are as follows:

1 *Gypona ramosa* sp. nov.
2 *Oncometopia lateralis* (Fabr.)
3 *Ceratagallia bigeloviae* (Baker)
4 *Poblicia thanatophana* sp. nov.
5 *Scolops cockerelli* (Fowler)
6 *Oliarus pima* sp. nov.
7 *Cochise apacheanus* g. and sp. nov.
8 *Amphiscepa bivittata* (Say)
9 *A. immaculata* sp. nov.
10 *Bruchomorpha mormo* sp. nov.
11 *Picumna ovatipennis* (Walker) ?
12 *Mistharnophantia sonorana* g. and sp. nov.

TETIGONIIDAE.

Gypona Germar.

1. *ramosa* sp. nov.

Allied to *G. marmorata* Fowler, as regards the position of the ocelli, the condition of the head and tegmina, &c.

Pale green, or greenish-testaceous; vertex with a short, narrow, longitudinal, brownish-yellow line on each side from the ocelli almost to the apical margin. Ocelli brownish-yellow. Pronotum with a transverse, sinuate pale fuscous line, also a blackish dot in the middle on each side below the eyes. Tegmina greenish testaceous, subhyaline, reticulate, all the areas ramose; veins green, margined narrowly with yellowish-testaceous; outer margin yellowish-testaceous, apical margin from apex of clavus to a corresponding point on the opposite side, very narrowly blackish.

Vertex transverse, produced nearly as far in front of the eyes in the middle as its basal length, subangulate, a little shorter than the pronotum, longitudinally sulculate in the middle. Ocelli placed in the middle of the vertex, about as far from the eyes as from one another. Head in profile, acute anteriorly and sublaminate. Tegmina apically acute, without appendix.

Female: ultimate segment somewhat deeply bisinuate, the central projection also notched.

Length $8\frac{1}{2}$ mill.

HAB. Arizona, Nogales; (Koebele's no. 2466).

The only specimen before me is carded, but the metapleura appear to be lobately ampliate (not at all in the same plane as the subventral pleurites), a character I do not find mentioned in descriptions of the genus.

Oncometopia Stal.

1. *lateralis* (Fabr.).

O. lateralis (Fabr.) Ball 1902 P. Iowa Ac. VIII, 45.

This species is distributed "from the Mackenzie River and Nova Scotia south throughout the whole continent, and to northern South America at least."

HAB. Arizona, Nogales (Koebele's no. 2445, August).

Ceratagallia Kirkaldy.

1 *bigeloviae* (Baker).

Agallia bigeloviae Baker, 1896 Psyche VII, suppl. 26.
A. bigelovia Osborn & Ball, 1898 Proc. Davenport Ac. Sci. VII, 62.

Previously described from New Mexico, Mexico and California baja. The single specimen is distorted by parasitization, but I think the determination is correct.

HAB. Arizona, Nogales; (Koebele's no. 2457).

FULGORIDAE.

Poblicia Stal.

1 *thanatophana* sp. nov.

Allied to *P. pallidoconspersa* Distant, but the head is partly pale and the tegmina are colored and conspersed differently.

Black; apical margin of vertex and basal margin of frons, testaceous. Sterna and legs minutely speckled with white, the latter with a few larger white spots, also the bases of the lateral spines on the tibiae. Subcostal cell and apical third of tegmina with numerous (mostly transverse) minute hyaline spots. Wings apically hyaline, veins blackish, apical margin narrowly smoky, basal third opaque black, base pale blue. Abdomen laterally, and above (except basally), red, the pleurites spotted with black.

Length 14 mill. to apex of tegmina, closed.

HAB. Arizona, Nogales; (Koebele's no. 2519).

Scolops Schaum

Scolops Schaum 1850 Ersch. & Grub., Cycl., Art. Fulg.
Ornithissus Fowler 1904 B. C. A., Hom. II, 114.

Fowler has redescribed *Scolops* and wrongly placed it in the Issidae.

1 *cockerelli* (Fowler).

Ornithissus cockerelli Fowler op. c., 122, Pl. 12, f. 14.

Previously recorded from Juarez on the northern frontier of Mexico. Fowler has omitted mention of the fuscous marks on the tegmina, but figures some.

HAB. Arizona, Nogales; (Koebele's no. 2487 Sept.).

Oliarus Stal.

1 *pima* sp. nov.

Blackish, keels of head and pronotum more or less ferruginous. Pronotum (except laterally), tegulae, antennae, the lateral extension apicalwards of the frons, etc., ferruginotestaceous. Tegmina hyaline, veins dark-brown, closely and minutely studded with blackish granules, some of which bear black hairs; subcostal vein ferruginotestaceous, narrowly bordered within with black; stigma black, whitish basally; there is a black spot, or rather suffusion, at the first forking of the brachial vein, and there is some brownish suffusion on parts of the apical third, both of cells and veins. Penultimate segment of rostrum, tibiae and tarsi, posterior margin of sternites, etc., dark ferruginous.

Vertex longer than wide, feebly carinate medianly, scarcely extending in front of the eyes; lateral margins forking at about three-fourths of the length of the eyes, the inner forks connected

with frons by short longitudinal keels before meeting, the fossettes thus being pyriform, rather large, and partly visible dorsally. The frons is much shorter than the clypeus medianly, but is produced laterally nearly as far apically as the middle length of the frons, the apical margin thus being deeply emarginate apically in a rounded manner. Axillary vein of clavus, taken from its curving at the commissure, about three-fourths of the length of the stalk of the anal, running into the anal, basal of the middle of the latter. Brachial vein forked distinctly nearer the base than is the radial. Stigma narrow, elongate triangular. First and second segments of hind tarsi each with 5 uneven, rather large spines.

Length 8 mill.

HAB. Arizona, Nogales; (Koebele's no. 2518 Sept.).

Fam. ASIRACIDAE.

Cochise gen. nov.

Vertex very transverse, keels obsolescent, impressed transversely on the basal margin, about one-fifth wider than an eye; with the eyes very distinctly wider than the pronotum. Frons medianly impressed transversely by a deep line, the basal part with 2 widely separated keels (a puncture between them in the middle), uniting on the middle of the apical part, which narrows concavely towards the apex, where it is truncate. Genae almost obsolete. Antennae arising almost at the exterior apical ocular angle, flattened and carinately foliaceous, one-third longer than the maximum width of the frons, first segment wider apically than basally, second five-eighths longer than the first. Clypeus rather swollen, carinate medianly. Pronotum scarcely longer medianly than the head, hind margin obtuse-angularly emarginate, median keel entire, a puncture on each side; lateral keels distant apically and basally, arising anteriorly at the interior margin of the eye, curving at an acute angle near the hind margin to meet the eye again, enclosing a puncture. Scutellum with the lateral keels obsolescent. Legs simple. Tegmina with the radial forked a trifle nearer the base than is the brachial; 7 apical cells; the second and third apical veins have a common base, the third reforking near the apex. Hind tibiae with a small spine near the base, four uneven, large spines at the apex; the spur large and broad, three-sided, each side flat not foliaceous, there are a number of very minute spines, scarcely visible, on one edge. The

first segment of the hind tarsi is longer than the others together and has about 6 spines.

1 *apachcanus* sp. nov.

Yellowish, browner on the frons. Clypeus and longitudinal lines on the fore and middle legs dark fuscous, hind legs testaceous. Metanotum and tergites subsanguineous. Tegmina hyaline testaceous, veins and granules concolorous; an elongate spot at apex of clavus, the inner margin broadly of apical third of tegmen, curving around to apex and a long suffused smudge on second apical vein, dark fuscous, but although the veins on these suffused parts are fuscous, the granules remain testaceous.

Pygophor long and narrow, lateral margins parallel.

Length 5 mill.

HAB. Arizona, Nogales; (Koebele's no. 2478).

Unfortunately only a single female, in bad condition owing to parasitization, of this interesting form. It is allied to *Perkinsiella* Kirkaldy and *Aracopus* Spinola, but is very different from anything hitherto described.

ISSIDAE.

Bruchomorpha Newman.

1 *mormo* sp. nov.

Black, partly with a brassy gleam. Legs yellowish, coxae and femora partly at least suffused with blackish. Vertex sublinear. Frons not very long, not extending outwards farther than the abdomen, in profile. Head nearly one-half higher than its width at the base between the eyes; sublateral keels of frons enclosing an oval, curved but not sinuate laterally. Puncturation much as in *B. oculata* Newman (probably generic). Tegmina formed much as in the latter species, or a trifle shorter, truncate apically, venation almost obsolete.

Length (female) 3 mill.

HAB. Arizona, Nogales; (Koebele's no. 2483).

The coloring agrees with the laconic description of *B. nasuta* Stal, but the frons is apparently much shorter.

Picumna Stal.

1 ? *ovatipennis* (Walker).

? *P. ovatipennis* (Walker) Fowler 1905 B. C. A. Hom. II 128, Pl. XII. f. 29.

A single male may be this, but seems to have a longer vertex and scutellum. Fowler gives no structural details and has confused at least two species, for his var. (f. 30) is certainly not conspecific.

HAB. Arizona, Nogales; (Koebele's no. 2524).

Amphiscepa Germar.

Melichar, in his monograph, does not clearly differentiate between this and *Acanalonia* Spinola, which I believe to be synonymous.

1 *bivittata* (Say).

HAB. Arizona, Nogales; (Koebele, Sept.). Widely distributed from Canada to Mexico.

2 *immaculata* sp. nov.

Brownish-yellow, tegmina and legs greenish, wings milkwhite with fuscous veins. Head dorsally twice as broad as long, gently rounded anteriorly, the vertex sublinear, separated from the frons by a transverse keel. Frons apically subrectanglarly (a little acutely) emarginate, not nearly so deeply, however, as in *A. bivittata*. No median keel on the frons, lateral margins acutely keeled, fairly straight for over half the length. Scutellum with 2 sublateral keels, but no trace of a middle one. Costal margin of tegmina arched.

Length 6½ mill.

HAB. Arizona, Nogales; (Koebele).

Distinguished from any other "*Amphiscepa*" by the absence of stripes or spots, and from any "*Acanalonia*" by the short head and absence of a middle keel.

POEKILLOPTERIDAE.

Mistharnophantia gen. nov.

Vertex transverse, about as wide as the eyes together, subtruncate apically, carinate in the middle, lateral margins sub-

parallel, scarcely extending before the eyes. Frons medianly keeled, and (with the exception of narrow, laterally rounded, lateral margins which are a continuation of the lateral margins of the vertex) raised, sloping flatly backwards and upwards, a part of the base, nearly as long as the vertex, being visible dorsally in front of the latter. This dorsal part of the frons is semicircular and impressed entirely within the margins, and, as implied above, is narrower than the vertex. Antennae small. Pronotum transverse, wider and a little shorter than the head, roundly arched anteriorly, slightly emarginate posteriorly. Scutellum bicarinate. Tegmina strongly decumbent, medianly convex, reaching posteriorly much farther than the abdomen. Costal cell broad, with cross veins; the radial and median springing from a common, short stalk, close to the brachial, but soon forking, the radial almost immediately reforking. The venation is rather obscure and ill-defined in places. There is no proper subapical line. The costal vein runs almost at right angles to the body, then curves roundingly to form the apical margin, almost at right angles again, meeting the commissure at, apparently, a very acute angle. Wings rudimentary (?). Hind tibiae with one spine.

1. *sonorana* sp. nov.

Brownish testaceous; a broad, dark fuscous stripe running from apex of head (dorsally) to hind margin of scutellum. Tegmina opaque, coriaceous, pale brownish yellow, veins partly concolorous, partly dark fuscous.

Length about $3\frac{1}{8}$ mill.

HAB. Arizona, Nogales; (Koebele's no. 2498).

Only one specimen in bad condition, unfortunately, of this curious form; it is parasitized.

It is very Issine in appearance, but the granulation of the clavus and the structure of the head proclaim it to be Poekiliopterine. It is probably allied to *Hypancylus* Fowler, which that author places, apparently incorrectly, in the Issinae.

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DIVISION OF ENTOMOLOGY

BULLETIN No. V

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

The Sugar Cane Leaf-Roller

(Omiodes accepta)

With an Account of

Allied Species and Natural Enemies

By OTTO H. SWEZEY

HONOLULU, T. H.
AUGUST 20, 1907

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LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar Planters' Association, Honolulu, T. H.

GENTLEMEN:—I, herewith, submit for publication Bulletin V of the Division of Entomology, prepared by Mr. O. H. Swezey. This Bulletin gives a very complete account of the cane leaf-roller and of other species closely allied to this destructive insect.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., May 21, 1907.

INTRODUCTION.

The cane leaf-roller and all the other moths of the genus *Omiodes* herein mentioned, are native to the Hawaiian Islands and occur nowhere else. It is a tropical and subtropical genus, other species occurring in South America, Central America, West Indies, Tonga Is., Fiji, Solomon Is., Malay Is., Upper Burmah, and even to E. Siberia, the latter being the farthest north that any species occurs. There are 15 Hawaiian species, and about an equal number in the other localities mentioned.

Hampson[1] places *Omiodes* under *Phryganodes* as a synonym; but our species do not agree with his characterization of that genus in respect to palpi and vein 7 of forewing. Our species more nearly correspond with his characterization of the genus *Nacoleia*, another tropical and subtropical genus.

The only species of Hawaiian *Omiodes* whose caterpillars have been previously described are *O. accepta*[2] and *O. blackburni*[3]. The caterpillars of all species are very similar in general, but vary in size respective to the size of the species, and in markings on head, cervical shield, and the tubercles, as is well shown in the figures. The pupae of the different species vary little except in size and degree of coloration—some being lighter in color, others darker. They all have similar habits of feeding, and of rolling leaves or otherwise fastening leaves together for a "retreat," to protect them from their enemies. The life-history of the different species varies somewhat, but in general is much the same as given for *O. accepta* and *O. blackburni*. The caterpillars obtain their growth in about 3 to 4 weeks, and the pupal period is about 1 to 2 weeks, which gives 4 to 6 weeks from egg to maturity. As they breed more or less the year round, there is time enough for several broods per year—about 6 to 8, tho there are seasons when they breed less prolifically and grow less rapidly than at others; so that perhaps there may be really a less number of broods per year.

[1] Hampson, the Fauna of British India, Moths, IV, p. 300, 1896.
[2] Dyar, Proc. Ent. Soc. Wash., VI, No. 2, p. 65, 1904.
[3] Dyar, Can. Ent., XXXII, p. 157, 1900.

As regards food-plants, the caterpillars of the different species are more or less restricted to particular food-plants. Four are grass-feeders: *accepta*, *continuatalis*, *localis*, *demaratalis;* two feed on sedge: *anastrepta*, *antidoxa;* two feed on *Astelia* (a Liliaceous plant): *iridias*, *asaphombra;* one feeds on *Dianella* (another Liliaceous plant): *monograma;* one feeds on leaves of various species of beans: *monogona;* one species on palms: *blackburni*; two species on banana: *meyricki* and *blackburni*. With the exception of one species (*monogona*) it is seen they are confined to the Monocotyledonous group of plants. Of those feeding upon grass, *accepta* is the only species which also attacks sugar cane to such an extent as to be considered a pest; in fact, there are only occasional instances of any other species feeding upon cane.

DESCRIPTIVE.

Family *PYRALIDAE*

Subfamily *PYRAUSTINAE*

Genus *OMIODES* Gn.

The following characters of the genus are given by Meyrick in the Transactions of the Entomological Society of London, p. 254, 1886:

Forehead oblique; ocelli present; tongue developed. Antennae five-sixths of forewings, in male moderately ciliated (1¼), rough scaled above. Labial palpi moderate, arched, ascending, with dense rough projecting scales beneath, terminal joint extremely short, obtuse. Maxillary palpi moderate, dilated with loose scales at apex. Thorax in male with patagia elongate, ending in a spreading pencil of long hairs. Abdomen in male elongate, with short anal tuft, valves retracted. Posterior tibiae with outer spurs one-third of inner. Forewings with vein 10 closely approximated to 9, 11 very oblique. Hind wings as broad as forewings; veins 4 and 5 closely approximated at base, 7 out of 6 near origin, anastomosing with 8 to near middle.

Omiodes accepta (Butl.), Sugar Cane Leaf-roller (Plate I, fig 1).

" ♂ ♀ 22-31 mm. Antennal ciliations one-third. Abdomen fuscous, segmental margins white, anal segment with two blackish marks. Fore

wings fuscous, darkest on costa towards base; veins whitish or whitish-ochreous; a dark fuscous dot towards costa at one-third, and a second (sometimes obsolete) in disc above middle; a dark fuscous fascia from beneath costa at three-fifths to one-third of inner margin, interrupted partially by veins, its anterior edge well-defined and preceded by an obscure ochreous-whitish line, slightly concave, posterior edge suffused; a nearly straight or faintly sinuous ochreous-whitish line from costa before apex to three-fifths of inner margin, anteriorly finely margined with dark fuscous, posteriorly followed by a rather broad dark fuscous suffusion; a thick interrupted blackish-fuscous hind-marginal line; cilia fuscous-whitish, with two fuscous lines, second sometimes suffused and obscure. Hind wings fuscous-grey; a transverse darker discal mark at one-third; a rather irregular nearly straight cloudy whitish line from costa at three-fourths to anal angle, preceded by a narrow and followed by a broader darker fuscous suffusion; hind-marginal line and cilia as in fore wings." [Meyrick, Trans. Ent. Soc. London, p. 214, 1888.]

This is a native moth, and its caterpillars were probably originally grass-feeders, but at the present time they feed largely upon sugar cane. It is found especially in sugar plantations, or the portions of plantations, which are quite high, or are near to the native forests; for example the upper parts of plantations of the Kohala, Hamakua, Hilo and Kau districts of Hawaii, but it is generally distributed however,—a few found in nearly all, if not all, of the plantations of these islands, but scarce in the irrigated plantations of the dry districts. Besides feeding upon sugar cane, it is also found along with other species of Omiodes, feeding upon Hilo grass (*Paspalum conjugatum*), *Paspalum orbiculare*, *Panicum pruriens*, and other grasses. I have also found the caterpillars feeding upon Pampas grass, and on a native sedge, *Baumea meyani*.

It is present in some fields of cane sometimes in such large numbers as to do considerable damage, in fact cases have been reported where the young cane has been entirely stripped of leaves. Such instances are not numerous, however, and even in the worst cases would not result in entire destruction of the crop of cane as it would grow again after the caterpillars had obtained their growth, or their parasites had got them checked. It is not usually to be considered a serious pest. Possibly it is not so abundant now as it was a few years ago when reports were made of cane fields having been entirely stripped by them.

At present there are a number of parasites preying upon this species and this keeps them well in check.

Life History

The eggs are deposited on the surface of a grass or cane-leaf, usually on the upper surface, in the groove of the mid-rib of the leaf (Plate I, figs 8, 9). They are in clusters of from 2 or 3 to as many as 30, and quite regularly arranged in rows, (when but a small number they are in one row) and a little overlapping like shingles. They are flat, nearly circular, about ⅔ mm. in diameter, very finely reticulated on both surfaces, slightly yellowish with a slight iridescent hue which shows more distinctly after hatching. Just previous to hatching, the young larvae may be seen coiled around inside the egg. They are conspicuous by their black heads.

Freshly hatched larvae are 1.5 mm. long. They are pale greenish; head black; no markings on the other segments; tubercles and hairs are conspicuous.

2nd Stage.—About 4 mm.; pale green; head with black spot at cluster of ocelli, a black dot in middle of each lobe in front; a black dot at postero-ventral angle, a black line on margin above it.

3rd Stage.—About 7 mm.; pale green; head as before; a black spot in each lateral lobe of cervical shield, a black dot behind each spot; on segment 3 tubercles ii are heavily black-margined below and in front.

4th Stage.—About 12 mm.; all marks are more conspicuous; the dot and spot in each lobe of cervical shield are united; a faint oblique dash on each side above paraclypeus.

5th Stage.—About 20 mm.; the markings are the same as in previous stage, and a faint black lateral margin to the cervical shield.

6th Stage.—(Plate I, figs. 2-5). Full-grown, 27 mm. Head rounded, slightly bilobed, pale luteous, upper part checkered with angular slightly darker spots; a rounded black spot about the middle of each half of face, two little oblique dashes a little above these and near median line, the black dot at postero-ventral angle in earlier stages is no longer present; ocelli black, except the lower posterior one; tips of mandibles black; tips of antennae brown. Body slender, cylindrical, uniform green, the dorsal vessel edged by a more or less distinct, opaque, white fat-body, the tracheae along sides show very distinctly through the integu-

ment. Tubercles broad, flat, somewhat convex, same color as body, each bearing a seta (certain ones 2 setae), arranged in several longitudinal rows; one tubercle per segment on each side of body. They are to be designated as follows: those on the dorsum are **anterior trapezoidal** (i) and **posterior trapezoidal** (ii), near the anterior and posterior margins respectively of segments 5–12*, the former are nearer the median line, on segments 3 and 4 each of these tubercles is double, i. e., has two setae, and ii is situated ventrally from i, instead of posterior to it; **supra-spiracular** (iii), a tubercle situated just above each spiracle, also one in a nearly corresponding position on segments 3 and 4; **sub-spiracular** (iv + v), a double tubercle just below each spiracle, it is composed of two united and bears two setae, on segments 3 and 4 it is in front of iii, on segment 2 it is in front of the spiracle (**pre-spiracular**); lateral (vi), a tubercle a little below iv + v and situated a little farther back; **marginal** (vii), situated on outer side of each proleg, and on inner side of each true leg, and on legless segments a little ventral from vi, each has three setae; **ventral** (viii) a small tubercle near median ventral line of each segment. Cervical shield same color as body, has two black spots near each lateral margin, the anterior spot the larger, sometimes the lateral margin is faintly black. On segment 3, tubercle ii is more or less black-margined on its lower and anterior sides, making a conspicuous black spot in line with those on cervical shield. Feet same color as body; spiracles yellowish-brown, those of segments 2 and 12 larger than the others.

The recently hatched larva feeds in the folded together tip of a grass leaf which it has fastened with silk. It eats the surface of the leaf in spots, leaving the under epidermis, which gives the appearance of dead spots on the leaf (Plate I, fig. 11); as it becomes larger it folds the leaf together lower down, doing this from time to time as it needs to enlarge its retreat, or have access to a fresh portion of leaf for feeding. In about two weeks the larva has grown to a length of 15 mm., and now eats the whole substance of the leaf, not leaving the epidermis as before. Having used up one leaf, the larva migrates to another, by spinning, rolls a portion of it into a tube (Plate I, fig. 10), within

* In numbering segments, the head is 1, prothorax 2, and the others in succession.

which it hides, protruding its head at the ends of the tube to feed upon the leaf; eventually its "retreat" becomes reduced by being eaten at the ends, and another leaf has to be taken; and so on, till the larva reaches its growth. Often a larva fastens several leaves together confusedly for a retreat, instead of rolling up just one.

On sugar cane the very young larvae feed in the crown of the plant where the young leaves have not yet unrolled. They are thus protected between the natural rolls of the leaf; later on they roll over the margin of a leaf forming a tube for their "retreat." When nearly full grown, they are usually found in tubes towards the tip of the upper leaves. These tubes are easily observed if the ragged leaves where the larvae have fed, are examined. The work of the smaller larvae shows as oval or elongate dead spots on leaves which have unrolled in the growing of the cane after the young larvae have fed upon them.

When disturbed in its retreat, as by its being torn open, or violently shaken, or jarred, the larva wriggles very lively and drops to the ground for escape. This habit is probably to escape from parasites, many of which prey upon them. The retreat which it constructs, is undoubtedly for the same purpose, as well as for protection from wasps and birds which prey upon.

The caterpillars are full-grown in about 3 weeks from hatching. They molt 5 times at intervals of about 3 to 5 days, and 5 to 7 days between the 5th molt and the spinning of the cocoon and pupation. Pupation takes place within a slight cocoon of white silk in the "retreat" where the caterpillar has lived; however, the cocoon is sometimes made beneath the leaf-sheaths of cane, and in othe favorable places.

Pupa.—(Plate 1, fig. 6). Length 12–14 mm., width about 2.5mm.; light brown, head darker; delicate hairs distributed as in the larva; cremaster somewhat flattened, blunt-pointed, with a cluster of 8 hooked spines fastened into the cocoon; spiracles slightly raised; wing-cases extending to the middle of the fourth abdominal segment, antenna- and leg-cases extending to about the middle of the sixth segment, free beyond the fourth segment.

The pupal period is 8 to 13 days, usually about 10 days.

Omiodes localis (Butl.) (Plate II, fig. 1).

"♂ ♀ 17–23 mm. Antennal ciliations one-third. Abdomen light fuscous, segmental margins whitish. Fore wings light fuscous; a dark fuscous line from one-fourth of costa to one-third of inner margin, angulated in middle, upper half indistinct, lower half well-marked; a dark fuscous dot in disc at two-fifths, and a transverse-linear mark beyond middle; a dark fuscous partially indistinct line, followed by a band slightly paler than ground colour, from two-thirds of costa to three-fifths of inner margin, upper half unevenly but moderately strongly curved outwards, the paler band followed by a somewhat darker suffusion; an interrupted blackish hind-marginal line; cilia whitish-fuscous, with a dark fuscous line. Hind wings light fuscous; an obscure darker transverse discal mark at one-third; a cloudy darker fuscous line from three-fifths of costa to inner margin above anal angle, rather bent in middle, beneath this rather irregular; a dark fuscous hind-marginal line; cilia whitish, with a dark fuscous line." [Meyrick, Trans. Ent. Soc. London, p. 217, 1888.]

This species is common on all the larger islands of the Hawaiian group, It is perhaps the most common species of those which are particularly grass feeders. The caterpillars are grass feeders, occurring with *O. accepta*. I have found them feeding on *Panicum pruriens*, *Paspalum conjugatum* (Hilo grass) and *Oplismenus compositus* ("Honohono" grass).

Full-grown caterpillar.—(Plate III, fig. 3). Length about 20 mm.; head similar to *O. accepta* with the addition of brownish markings on the vertex and sides, and a black dot at the postero-ventral angle of head. Cervical shield with black margins to its lateral lobes; two black spots in each lateral lobe, the anterior one twice as large as the posterior one, sometimes they are united; on the level with these spots is a brownish one between segments 2 and 3; black upper margin to the tubercle in front of spiracle. Tubercle ii of segment 3 has black lower margin, thickened anteriorly; on segment 12 tubercle ii has black ventral margin, and tubercle iii has black dorsal margin, thickened posteriorly.

Pupa.—10 mm. long, medium brown, eyes black, hairs and cremaster similar to *O. accepta*; antenna- and leg-cases extending a little beyond 6th abdominal segment, free beyond 4th segment. Pupa formed in slight cocoon where the caterpillar lived. Pupal period 8–11 days.

Omiodes demaratalis (Walk.) (Plate II, fig. 3).

" ♂ ♀ 21-24 mm. Antennal ciliations one-fourth. Abdomen light ochreous, segmental margins white. Fore wings yellowish-ochreous, more or less tinged with reddish or brownish ; costa suffused with rather dark fuscous from base to three-fourths ; a dark fuscous dot in disc at two-fifths, and a small transverse-linear dark fuscous mark beyond middle ; an almost straight white line from beneath costa at three-fourths to inner margin at two-thirds, anteriorly margined with dark fuscous ; a hind-marginal row of blackish dots ; cilia grey-whitish, with a grey line. Hind wings whitish-fuscous, towards hind margin becoming pale ochreous ; a dark grey transverse discal mark at one-third : a strong white line from beneath costa beyond middle to anal angle, margined anteriorly with dark fuscous ; an interrupted blackish hind-marginal line ; cilia white, with a grey line." [Meyrick, Trans. Ent. Soc. London, p. 216, 1888].

This moth has been recorded from Oahu, Kauai, and Hawaii. It is less common than the other grass-feeding species of *Omiodes*, but I have sometimes seen them quite abundant locally. The caterpillars probably feed on several species of grass. I have found them on *Panicum pruriens* and *Paspalum conjugatum* (Hilo grass). They feed similarly to *O. accepta*.

Full-grown caterpillar.—(Plate III, fig 4). Length 22-25 mm.; grass-green where the contents of alimentary canal show thru, otherwise pale yellowish; head testaceous, a black spot including ocelli, a round black spot in middle of each half of face in front, a tiny blackish dot on postero-ventral margin of head, some pale brownish mottling on upper part of head; mandibles brown, apical half black. Cervical shield with a strong black posterior and lateral margin, interrupted in median line behind; a few tiny dots near dorsal anterior margin, also a few faint ones near posterior margin; a large black spot, with a smaller one behind it in each lateral lobe of cervical shield; tubercles iv. + v. and vi. are partially brown-margined. Tubercles i, ii and iii of segment 3, and i and ii of segment 4 have black margins, not always complete, heaviest on anterior margin; tubercles i, ii and iii of segments 11, 12 and 13 are mostly marked with black in some part of the margin, sometimes some of them entirely surrounded; often some faint markings on some of the tubercles of the other segments, sometimes forming two rows of faint marks a little above the line of spiracles.

Pupa.—12 mm. long, very dark brown; spiracles slightly

raised; hairs very delicate, distributed as in other *Omiodes*; cremaster blunt-pointed, with 8 hooked spines. Pupa formed in place where the caterpillar had lived. Pupal period about 12 days.

Omiodes continuatalis (Wall.) (Plate II, fig 2).

" ♂ ♀ 27-31 mm. Antennal ciliations one-fourth. Abdomen light greyish-fuscous, becoming blackish-grey posteriorly, segmental margins white. Fore wings rather dark fuscous; a narrow white central longitudinal streak from base to near middle; a slender white longitudinal streak in disc above middle from one-third to two-thirds, sometimes obscure; sometimes a dark fuscous dot in disc at one-third and another in middle, especially in female; a strong nearly straight white line from immediately beneath costa at three-fourths to inner margin at two-thirds, thence slenderly produced along inner margin to one-third, sinuate inwards below the middle, anteriorly edged with darker; a whitish irroration forming an obscure hind-marginal border; a thick interrupted blackish-fuscous hind-marginal line; cilia fuscous-whitish, with a thick fuscous line. Hind wings fuscous; an obscure darker discal spot at one-third; a strong nearly straight white line from beneath costa at two-thirds to anal angle, slightly sinuate near lower extremity, preceded by a cloudy dark fuscous line; a thick blackish-fuscous hind-marginal line; cilia white, with a dark fuscous line." [Meyrick, Trans. Ent. Soc. London, p. 215, 1888].

This moth occurs commonly on all of the islands of this group; in some localities very abundantly. Its chief food plants so far as I have observed are *Heteropogon contortus* ("Pili" grass) and *Paspalum conjugatum* (Hilo grass). On one occasion I saw the moths very numerous in a field of introduced grass at Olinda, Maui, but I could find no caterpillars at the time, altho they had presumably fed on this grass. Mr. Terry has reported it in one instance feeding on sugar cane on Kauai.

The caterpillars of this species are in the habit of hiding among the mass of dead leaves at the base of tufts of grass, and feeding on the lowermost accessible green leaves instead of feeding on upper leaves and hiding in a rolled up leaf, as several of the other species of *Omiodes* do. However, where several were feeding on grass in a breeding cage, one caterpillar rolled up a leaf to hide in. The pupa is formed in a slight cocoon in the same place that the caterpillar had for a hiding-place. Pupal period is about 12-15 days.

Full-grown caterpillar.—(Plate IV, figs. 1-3). Length 28-30 mm.; testaceous-green, with a rosy tinge; hairs situated in black dots on the broad flat tubercles; head testaceous, two roundish black spots in front, one in middle of each lobe of face, two small blackish markings on the sutures near middle and a little higher up, postero-lateral margins of head slightly browned; a black spot including the ocelli, except the lower outer one; mandibles brown, black at apex. Cervical shield with two small black dots in middle near anterior margin; in each lateral lobe a large black spot and a tiny one behind it, lateral margin brown. The tubercles below the spiracles of segment 2, and all tubercles of the other segments are more or less blackish-brown margined, those of the three posterior segments most pronounced; tubercles i and ii of segment 3 often partially joined; in younger caterpillars tubercles of segments 3, 4, 11, 12 and 13 are mostly black; spiracles of segments 2 and 12 are larger than the others.

Pupa.—Length 13-15 mm.; very dark brown; hairs as usual with *Omiodes* pupae; cremaster blunt-pointed, with a cluster of hooked spines at apex; antenna- and leg-cases extending to near the posterior margin of the 6th abdominal segment, free beyond the 4th segment.

Omiodes anastrepta Meyr. (Plate II, fig 7)

" ♀ 28-29 mm. Head thorax, and abdomen fuscous. Palpi dark fuscous, lower half white. Fore wings moderate, termen faintly sinuate beneath apex; rather dark fuscous, more or less whitish-sprinkled; first line whitish, angulated above middle, nearly or quite obsolete above angulation, lower portion margined posteriorly by a thick blackish-fuscous streak which ls nearly rectangularly bent and continued beneath median vein to discal mark, this angle sometimes filled with dark suffusion; a small black orbicular dot; a transverse blackish discal mark; second line whitish, slighly sinuate beneath costa, edged posteriorly by a suffused dark fuscous band, and sometimes anteriorly by a series of dark fuscous dots; a terminal series of blackish dots. Hind wings rather dark grey a paler slightly sinuate postmedian line, edged anteriorly with dark grey dots, and posteriorly by a band of dark grey suffusion; a terminal series of blackish dots." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 204, 1899].

The male is similar to above description of female.

This is a rather rare species. It has been collected in Kona, and

Kilauea, Hawaii; in the mountains of Molokai; and in Koolau mountains above Waialua, Oahu. The caterpillars feed on sedges, probably on but a single species, (*Carex oahuensis*), for where I collected quite a number of caterpillars at Kilauea, they were all on this species of sedge, altho there were several other species growing inter-mixed at the same place. They feed in the crown of the sedge plant, eating the newer leaves and spinning them together for a "retreat." From these caterpillars I succeeded in rearing several moths of both sexes. I caught one male in the same place. But one specimen was taken by Dr. Perkins in each of the other localities mentioned.

Caterpillar.—(Plate III, fig. 5). When full-grown, about 25 mm. long; bright green; head paler and slightly testaceous above; ocelli black; two rounded spots on face, outside of each is another, not so regular in shape, which makes a nearly horizontal row of four spots; two elongate spots extending from near the top of head obliquely downward in front nearly to the two inner spots of the horizontal row of four, above these there are often two small dots and outside of the latter on the top of the head is a black spot on each side of the head, often two or three irregular ones close together or more or less connected; sometimes there is a black bar extending obliquely outward and upward from each of the round spots in front of the face. Cervical shield without black lateral margins; two black spots in each lateral lobe, the anterior one larger and slightly elongate; two spots near anterior margin, wide apart, often a tiny dot outside of each. Segment 3 with tubercles i and ii mostly black. Often tubercles i and ii of segment 4, and i, ii and iii of segment 12 slightly marked; those of the other segments are unmarked, and less conspicuous than is usual with *Omiodes* caterpillars; tubercles i and ii of segment 3 strongly conical as compared with the others, those of segment 4 somewhat conical also.

Pupa.—About 11 mm. long; pale brownish, with greenish tinge on thoracic region; eyes nearly black; wing-cases extending to posterior part of 4th abdominal segment, the pointed apex extending one segment further and free; leg-cases and antenna-cases extending to posterior margin of 6th segment, free beyond 4th segment; cremaster short, blunt-pointed, with several hooked spines. Pupal period about 15 days.

Omiodes antidoxa Meyr. (Plate II, fig. 8).

" ♂ 24 mm. Head, thorax, and abdomen light fuscous, mixed with whitish, anal tuft mixed with dark fuscous. Palpi dark fuscous, lower half white. Fore wings moderate, apex rather prominent, termen sinuate beneath it; light fuscous, mixed with whitish-ochreous; first line represented by a thick black streak from ¼ of dorsum to beneath discal spot, its upper edge very obtusely angulated-prominent beneath orbicular dot; a black orbicular dot, and small transverse-oval discal spot; second line obsecurely pale, followed by a thick blackish posteriorly suffused streak, straight except toward costa, where it curves towards apex; a terminal series of blackish triangular dots. Hind wings fuscous, mixed with whitish-fuscous; a cloudy dark fuscous discal dot; a straight pale postmedian line, edged posteriorly with dark fuscous suffusion; an interrupted dark fuscous terminal line." [Meyrick, Fauna Hawaiiensis, III, Pt. IV, p. 358, 1904.]

Aside from sexual characters the female is similar to above description.

This is a very rare species. A few specimens were collected by Dr. Perkins in Koolau mountains above Waialua, Oahu. I have reared several moths from caterpillars found feeding on a sedge (*Rhyncospora thyrsoidea*) in the mountains above Palolo, Oahu. My specimens may possibly be a new species; but they only differ from the specimens of *antidoxa* collected by Dr. Perkins, in being a darker shade and the orbicular dot less conspicuous, often absent, and in having a wider space beyond second line of fore wing.

On two different occasions I collected caterpillars from a certain patch of sedge in the Palolo locality mentioned above; but altho the same species of sedge was abundant in other places on the ridge, I found none of the caterpillars elsewhere. They probably feed upon but the one species of sedge; however, in rearing them in breeding jars they readily fed on a different species of sedge, *Cyperus rotundus*, the species which is such a nuisance in many lawns, gardens and some sugar plantations, commonly called "Japanese grass," "nut grass," and "bulb grass." The caterpillar usually feeds in the heart of the sedge plant, eating the newer leaves, and spinning them together for a "retreat."

Life History

A cluster of 3 eggs were found on the groove of the middle of upper surface of a sedge leaf. They are similar to the eggs of *O. accepta*. They hatched the next day. The tiny caterpillars were whitish, with black heads. Length 1.5 mm. One was bred thru to maturity, fed upon *Cyperus rotundus*. The first molt occurred on the third day. It was then light green, and the head was no longer black. When about 5 mm. long, it was pale green; head with 2 black spots in front, black ocelli, and a dot at each postero-ventral angle; cervical shield with black spot in each lateral lobe; tubercle ii of segment 3, black.

When 10 days old it was 11 mm. long. The head now has the two round black spots in front, black eye-spots, and a black dot at each postero-ventral angle. Cervical shield, and segments 2 and 12 have the markings of full-grown caterpillar.

After a moult about the 12th day, it was 13 mm. long. In addition to above markings there are also present on the head, two large black spots on each side above the eye-spot, and two faint short oblique bars in front near middle and near the top of the head. This is very near to the markings of full-grown caterpillar.

Not all of the molts were observed, but when 20 days old the caterpillar was about 25 mm., full-grown, and had begun to spin a cocoon.

Full-grown caterpillar.—(Plate III, fig. 6). Bright green, darker along dorsal vessel; head testaceous, with the usual rounded black spot in each lobe in front, ocelli black, above the ocelli on each side of head three large irregular spots, two oblique bars near middle of top of head in front, the black dot at postero-ventral angle of younger stages is not present. Cervical shield without black margin, a black bar followed by a dot in each lateral lobe, two tiny black dots near middle in front. Tubercle ii of segment 3 faintly black-margined below, and very strongly in front, broadly conical, higher than the other tubercles. Tubercles i, ii and iii of segment 12 faintly black-margined. Among other caterpillars bred, sometimes the tubercle in front of spiracle of segement 2, tubercle i of segment 3, and tubercle ii of segment 4, are faintly blackened on some part of margin. The incisures

between segments are very shallow, giving the caterpillar a very smooth surface.

Pupa.—12 mm. pale brown with greenish tinge especially in thoracic region, a greener median line on dorsum of abdomen, eyes darker; wing-cases extending to apex of 4th abdominal segment, apical point a little further, antenna- and leg-cases extend a little beyond apex of 5th abdominal segment, free beyond 4th segment; cremaster short, blunt, with 8 hooked spines fastened into the cocoon. The cocoon is slight and made in the retreat where the caterpillar lived. Pupation takes place in 2 to 4 days after the cocoon is started. Larval period 20 to 22 days; pupal period 10 to 11 days.

Omiodes monogramma Meyr. (Plate II, fig. 9).

"♂. 25–29 mm. Head and palpi deep ferruginous, lower half of palpi white. Thorax ferruginous, posteriorly paler and mixed with whitish-ochreous. Abdomen ferruginous-ochreous, segmental margins usually finely white. Forewings moderate, termen gently bowed; ferruginous; costa suffused with dark fuscous from base to $\frac{3}{5}$; second line about $\frac{3}{4}$, almost straight, white, obsolete on costa, posteriorly edged with fuscous suffusion; a dark fuscous terminal line; cilia grey, with darker sub-basal line. Hindwings fuscous, usually suffused with dull ochreous towards dorsum; a white postmedian line, obtusely angulated near tornus, posteriorly edged with dark fuscous suffusion, beyond which the terminal area is wholly ferruginous-ochreous; a dark fuscous terminal line; ciali whitish, with dark grey sub-basal line.

Allied to *O. demaratalis*, but differs by the larger size, ferruginous colouring, absence of orbicular and discal dots, second line of forewings placed nearer termen, and postmedian line or hindwings obtusely angulated and followed by dark fuscous suffusion." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 205, 1899.]

The females have less fuscous suffusion than described above for the males. Sometimes these are faint fuscous orbicular and discal dots in forewings, and a faint discal dot in hindwings.

This species is common locally in the mountains of Kauai, Oahu, and Hawaii. Its distribution is restricted to the regions where its food plant grows, as the caterpillars apparently feed upon but one species of plant, a native Liliaceous plant (*Dianella odorata.*) The caterpillars feed inside a leaf folded together along the mid rib, so that the margins come together above. The

leaf when young is folded thus and if the caterpillars take possession at this time, they can easily fasten the edges so that the leaf will not open. I have found them sometimes within a leaf folded together below, which would be a more difficult matter to accomplish. Usually there is one larva to a leaf, but I have often found several, in one instance 7 were found in one leaf. When young, they begin feeding at the apex of the leaf; and gradually work downward, folding together more and more of the leaf as they need it for a hiding place. They eat the substance of the leaf except the lower epidermis, which is left in a dried up condition enclosing a mass of "frass" which the caterpillars have produced. Pupation takes place with only a slight cocoon, within the folded leaf.

Caterpillar.—(Plate III, fig. 7). Length about 20–22 mm.; pale yellowish green; head similar to *O. accepta* except that the two oblique marks near top of head in front are absent, the two spots in the face are much smaller and fainter, and there is a black dot at each postero-ventral angle of head. Cervical shield with black lateral and posterior margin, fainter posteriorly, often interrupted in dorsal part; two black spots in lateral lobes, the anterior one elongate, the posterior one a mere dot. Tubercles i, ii, iii and iv + v of segment 3 very conspicuously black-margined, those of segment 4 nearly as black-margined, and i, ii and iii of segments 11 and 12 are also nearly as black-margined, those of the other segments more or less margined also.

Pupa.—Length 12–14 mm., very pale uniform brownish; leg- and antenna-cases extending a little beyond 5th abdominal segment; in other respects similar to other *Omiodes* pupae. Pupal period about 12–14 days.

Omiodes iridias Meyr. (Plate II, fig. 6).

"♂ ♀. 27–28 mm. Head and thorax dark fuscous, with white line above eyes. Palpi dark fuscous, lower half white. Forewings rather long, termen slightly sinuate beneath apex; dark fuscous, irrorated with dull purplish; lines obscurely paler, first obtusely angulated above middle, obsolete on costa, second very obtusely angulated below middle, straight or slightly curved on upper portion, sinuate inwards below angulation; enclosed median band in ♂ hardly darker, somewhat ferruginous-mixed on dorsal half, in ♀ blackish except towards costa, upper

edge excavated on anterior half, with a blackish orbicular dot in excavation before middle; a terminal series of dark fuscous or blackish dots; cilia fuscous, with darker subbasal line. Hindwings rather dark fuscous; an obscurely paler slightly sinuate postmedian line, anteriorly darker-edged; cilia as in forewings." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 203, 1899.]

This species is not common, except very locally, on account of the distribution of its food-plant. The caterpillars have been found on only one species of plant, Silver Sword *(Astelia veratroides)*, one of the few native species of Liliaceous plants. The plant grows on exposed ridges or slopes at elevations of 2000 to 6000 feet; often very abundant. So far, this moth and its caterpillars have been collected only at Kilauea, Hawaii. I have found the catterpillars very numerous, but failed to rear more than a single pair to maturity. Dr. Perkins has also bred a male and a female from caterpillars from the same place.

The caterpillars feed on the inner leaves at the crown of the plant, and between leaves where they are close together. When small, they are much hidden by the dense woolly material which covers the surface of the leaves, especially when young. They eat one surface and the mesophyll of the leaf, leaving the opposite epidermis.

Caterpillar.—(Plate III, fig. 2). Length about 27 mm.; rather slender; pale whitish green, the dorsal line brownish, younger ones quite pale. Head similar to *O. accepta*, with the addition of black dot on postero-ventral margin, and a brownish dot above ocelli. Cervical shield has black lateral margins; two black spots in lateral lobes, the anterior ones elongate, the posterior ones round; two tiny dots near the middle near anterior margin; the tubercle in front of prothoracic spiracle has a little black on upper margin; two brownish spots on each side between segments 2 and 3. Tubercle i of segment 3 is a little blackened on lower margin, and tubercle ii is heavily black-margined all around except a little space on the upper side. Tubercles i and ii of segments 11 and 12 are more or less faintly margined all around, and tubercle iii of segment 12 is more heavily margined on upper side. Tubercles of some of the intermediate segments often family margined.

Pupa.—15 mm.; medium brown; wing-cases extending to apex of 4th abdominal segment, leg- and antenna-cases extending

to about the middle of 6th abdominal segment, free beyond the 4th segment; cremaster truncate triangular, with 4 pairs of hooked spines fastened into the cocoon. Very similar to other *Omiodes* pupae. Pupation takes place in a slight cocoon in the caterpillar's "retreat."

Omiodes asaphombra Meyr. (Plate II, fig. 5).

"♂. 35 mm. Head, thorax, and abdomen fuscous. Palpi fuscous, lower half white. Forewings long, termen slightly sinuate; fuscous, somewhat mixed with whitish and darker; a very broad dark fuscous median band mixed with ferruginous, not reaching costa, anterior edge straight, anterior half of upper edge excavated, with a dark fuscous orbicular dot in excavation before middle, posterior edge wholly suffused and undefined; a terminal series of dark fuscous dots. Hindwings rather dark fuscous; a slightly paler postmedian shade, darker-edged, obtusely angulated in middle." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 202, 1899.]

Female of similar coloration to the male.

This is a rare species. So far it has been collected only at Kilauea, Hawaii, the Waimea Mountains of Kauai, and the mountains above Palolo, Oahu. The caterpillars feed only on Silver Sword *(Astelia veratroides)*, and, hence, the species is restricted to those localities of the mountains where this plant grows. I have found the caterpillars feeding between the leaves at the crown of the plant where they are close together. They eat the surface and substance of the leaf, leaving the opposite epidermis, which shows as dead portions of the leaves. In some small plants, I found the caterpillars boring down into the stem where they had been feeding between the leaves in the middle of the crown of the plant.

Caterpillar.—(Plate III, fig. 1). Full-grown about 27 mm.; bright green if they have been feeding on the greener leaves, paler if they have fed in the inner part of the crown where there is very little chlorophyll in the leaves; darker green along the dorsal vessel. Head very pale testaceous, the two black spots on the the face are much smaller than they are in the other *Omiodes* whose caterpillars are known; ocelli black, a black dot at each postero-ventral angle. Cervical shield with black lateral margin, heavier anteriorly; a large and a small black spot in each lateral

lobe, the small one posterior to the other; two tiny dots near middle of anterior margin; tubercle in front of spiracle faintly blackened on upper margin. Tubercle ii of segment 3 has heavy black ventral margin, especially anteriorly. Some markings on margin of tubercles i, ii and iii of segment 12; tubercles of other segments unmarked.

Pupa.—12 mm. long; uniform very pale brown; wing-cases extend to posterior margin of 4th abdominal segment, leg-cases and antenna-cases extend about one and a half segments farther; otherwise similar to *O. accepta*. The pupa is formed in slight cocoon in the caterpillar's "retreat." Pupal period 11 to 12 days.

Omiodes blackburni (Butl.) Palm Leaf-roller (Plate II, fig. 10).

"♂. 30 mm. Antennal ciliations one-fourth. Abdomen pale ochreous, segmental margins white. Fore wings pale brownish-ochreous, veins ochreous-whitish, separated at origin by a dark fuscous suffusion; an ochreous-whitish line, acutely angulated outwards in middle, from one-fourth of costa to one-third of inner margin, posteriorly margined with dark fuscous, anteriorly by a broad dark fuscous suffusion between veins; an ochreous-whitish transverse discal spot; an ochreous-whitish line from three-fourths of costa to three-fifths of inner margin, sinuate outwards beneath costa, below middle forming an acute triangular projection outwards, anteriorly margined with dark fuscous, posteriorly by a broad dark fuscous suffusion between veins; a slender interrupted dark fuscous hind-marginal streak; cilia whitish-ochreous, with a fuscous line. Hind wings rather densely haired towards inner margin; pale whitish-fuscous; an indistinct darker discal spot; a cloudy whitish line from two-thirds of costa to anal angle, with an acute projection outwards in middle, anteriorly narrowly, posteriorly broadly suffusedly margined with dark grey; a slender dark grey hind-marginal streak; cilia whitish, with a dark grey line." [Meyrick, Trans. Ent. Soc. London, p. 214, 1888.]

Expanse of males often 35 mm.; females 33-38 mm. The females are usually paler than the males, have less fuscous suffusion, often with ferruginous-ochreous suffsion in fore wings, and the lines less distinct.

This is about the largest of our *Omiodes* species. It occurs on all of the islands of the group, especially where coconuts grow. The caterpillars feed on the leaves of various species of Palms,

particularly Coconut Palm. They are said to feed on Banana also; but I have never seen them on Banana. It is a serious pest on the Coconut Palm, causing the leaves to have a very ragged, unsightly appearance.

Life History

The eggs are laid in regular rows in a narrow mass by the side of a rib of the leaf or leaflet. They are much flattened, roundish, and overlap similarly to shingles. I have counted as many as 84 in one cluster, but usually a less number, about 30-50. The young larvae feed gregariously on the under side of leaf, protected by a thin web of silk. At first they eat the substance of the leaf, and leave the opposite epidermis. They soon scatter more or less, and make hiding places by fastening together the lower edges of coconut leaflets, often several caterpillars in the same place. As they become a little larger, they eat the whole substance, eating from the edge, and not leaving the epidermis. As they get the leaflet mostly eaten, they migrate to other leaflets, and where they are numerous they soon mutilate every leaflet of the leaf. The caterpillars are full-grown in about 4 weeks from hatching. They molt five times at intervals of 4 to 5 days, and a little longer period between 5th molt and time of pupation.

Freshly hatched caterpillars are whitish, about 2 mm. long; head very pale testaceous, with faint blackish dot at cluster of ocelli, and a fainter one in middle of front of each lobe. In addition to these markings, after the first molt, there is a black dot in each lateral lobe of the cervical shield; and tubercles ii of segments 3 and 4 have a black spot at lower margin.

After the second molt, in addition to above markings, the head has the markings of the full-grown caterpillar, but they are faint; and tubercles iii of segments 11 and 12 are black-margined. All of these markings become more conspicuous after third and fourth molts. After the fourth molt the anterior and lateral margins of the cervical shield are somewhat blackened.

Full-grown caterpillar.—(Plate IV, figs. 4, 5). Length 32-35 mm.; dull greenish, with two dorsal whitish lines, also whitish on line of spiracles. Head testaceous, a black spot including ocelli, above this a row of three irregular spots extending to vertex, often connected; a round black spot in middle of each half of face, these with one of the spots on each side of head

make a horizonal row of 4; two parallel spots in middle near top of head, as viewed from in front; mandibles black at tip.

Cervical shield black-margined nearly all around, most strongly anteriorly, interrupted in middle anteriorly and posteriorly; two small dots in middle near anterior margin, a pair on each side of median line near the posterior margin; two large black spots in lateral lobe of cervicle shield, the anterior one larger, often connected. The tubercle in front of 1st spiracle has black dorsal margin. The dorsal and supra-spiracular tubercles of segments 3 and 4 have a black spot on their ventral margin, often lacking on dorsal tubercle of segment 4; often the tubercles of the other segments are faintly margined, especially those of segment 12. When ready to pupate the caterpillars are quite yellowish. Pupation takes place in a slight cocoon in the caterpillar's "retreat."

Pupa.—Length 15-19 mm.; light to dark brown according to age. There are two rows of delicate hairs on the back situated where there were tubercles on the caterpillar, another row just above line of spiracles, and a row below spiracles; two rows on each side of ventral median line. Cremaster quite sharply pointed, provided with 8 hooked spines which are fastened into the cocoon; wing-cases extending nearly across 4th segment, antenna- and leg-cases extending about half way across 6th segment of abdomen, free beyond 4th segment; spiracles slightly raised. Pupal period 11-13 days.

Omiodes meyricki n. sp.

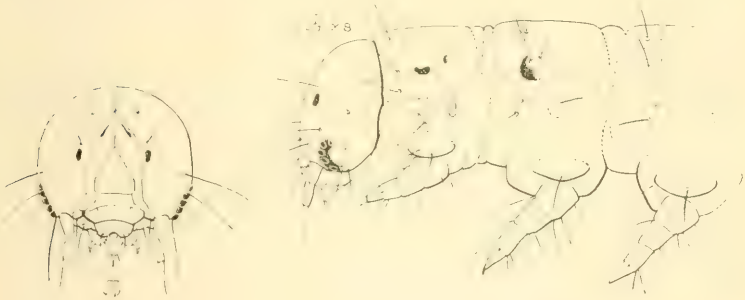
♂ ♀. 30-35 mm. Head, thorax and abdomen dull ferruginous; scales of patagia with fuscous tips, apical margins of abdominal segments whitish-ochreous. Palpi fusco-ferruginous, lower half white. Fore wings suffused with ferruginous, veins ochreous-whitish; first line ochreous-whitish, acutely angulated outwards in the middle, posteriorly magined with dark fuscous; an ochreous-whitish transverse discal spot; second line orchreous-whitish, sinuate outwards beneath costa, below middle forming an acute triangular projection outwards, anteriorly usually margined with dark fuscous, sometimes posteriorly followed by broad dark fuscous suffusion between the veins, sometimes none of this suffusion, especially in the males; a terminal row of dark fuscous spots between the veins, cilia pale fuscous, darker at base. Hind wings medium fuscous, veins pale, an indistinct darker discal spot; a whitish-fuscous postmedian line with an acute projection outwardly in the

middle, anteriorly broadly margined with dark fuscous; a terminal row of dark fuscous spots between the veins, preceding this a pale fuscous streak; cilia whitish, dark fuscous at base.

Very closely allied to *O. blackburni*. The pattern of the wings is the same; but this species is in general distinctly ferruginous colored, and the sexes are only slightly different; often the markings of the wings of males are less distinct than those of the females. The males of *blackburni* have a suffusion of dark fuscous in fore wings, whereas the males of this species have a suffusion of ferruginous in fore wings. The hind wings of this species in both sexes are darker fuscous than those of *blackburni*, and the postmedian line is distinctly nearer the termen.

I take pleasure in dedicating this species to Mr. E. Meyrick, whose valuable work on the Lepidoptera of the Hawaiian Islands, in Fauna Hawaiiensis, is indispensable to a student of the Macrolepidoptera of these islands.

Quite a series of both sexes of this moth, I reared from caterpillars collected at Honomu, Hawaii. Several broods of them



Omiodes meyricki

Fig. 1.—Adult male.

" 2.—Lateral view of head and anterior segments of caterpillar.

" 3.—Front view of head of caterpillar.

(This moth was discovered after the plates for the Bulletin were made).

were feeding gregariously on leaves of some wild banana plants, at the side of a gulch near the upper part of the sugar plantation, at an elevation of about 1500 feet. I also collected several clusters of their eggs from which I reared to maturity the caterpillars that hatched. These eggs were nearly all parasitized, however, by the tiny yellow Chalcid fly (*Tricogramma pretiosa*). The parasitized ones being black, and the adult parasites emerged from them in a few days.

Life History

The eggs are deposited in clusters on the under suface of banana leaves. The number per cluster, in those I collected, was respectively 30, 40, 52 and 60. They are quite similar to other *Omiodes* eggs, but less flat, and the clusters are put directly on the surface, not in a groove or some such place as is customary with *O. accepta* and *O. blackburni*, nor are they arranged in such regular rows.

The freshly-hatched caterpillars are about 2 mm. in length; very pale greenish; head not black as are those of *O. accepta*, but with a black spot at eye-cluster.

2nd Stage.—About 4-5 mm.; similar to previous stage with the addition of a tiny black dot in the middle of front of each lobe of head, a black dot in each lateral lobe of cervical shield, and a black dot on tubercle ii of segment 3.

3rd Stage.—About 8-10 mm.; similar to previous stage, but the black markings are more conspicuous, and there are also two short, faint, oblique lines near middle of head and a little higher up than the two round spots in front.

4th Stage.—About 12-15 mm.; very pale bluish-green; the white fat bodies show plainly thru the transparent skin along each side of the dorsal vessel; head concolorous with the body, with black markings as in previous stage, but still more conspicuous (in some caterpillars, in addition to these markings, there are two transverse oval spots, one on each side of head on top); cervical shield with a tiny dot behind the black spot in each lateral lobe, two tiny dots near middle in front; tubercle ii of segment 3 very strongly black-marked in front and below; no other tubercles have black markings.

5th Stage. About 18-24 mm.; markings similar to previous stage.

6th Stage.—Full-grown caterpillar about 32-35 mm.; light

green, body-wall quite transparent so that the numerous fat bodies show thru and give a good deal of whitish appearance, especially along the sides of the dorsal vessel; head uniform pale greenish, a roundish black spot in each lobe in front, two short oblique lines near middle a little higher than these, none of the caterpillars have the two oval spots on top of head which some had in two previous stages; ocelli dark brown; cervical shield has a black spot in each lateral lobe, a faint dot behind each, two faint dots near middle in front, lateral lobes not at all black-margined; a black spot on lower anterior part of tubercle ii of segment 3; no markings on the tubercles of the other segments. Altho this moth is most similar to *O. blackburni*, its caterpillars are very differently marked from those of the latter, tho both have similar feeding habits—these being the only two species among those whose caterpillars are known, which are especially gregarious tho those of *O. monogramma* are gregarious to some extent. The head and tubercles of *blackburni* caterpillars have numerous black markings, while in this species the caterpillars have very few markings—perhaps fewer than any other species; in this they are very similar to the caterpillars of *accepta*, tho somewhat larger.

The pupa is about 14-17 mm.; similar to the pupa of *O. blackburni*, but a little smaller.

The young caterpillars feed gregariously on the under surface of a banana leaf along the side of the midrib. They spin a slight web for mutual protection, being covered by this and their excrement which is caught and retained by the web. They eat the lower epidermis and the parenchyma of the leaf, leaving the upper epidermis, making it look like dead spots in the leaf where they have fed. When about half-grown, they eat the whole substance of the leaf making a ragged appearance; and they become more separated and roll up the edge of the leaf for a "retreat." They molt five times at intervals of about three days, and about 7–10 days between the 5th molt and the time of pupation, which gives about 22–25 days for the length of the caterpillar stage. The pupa is formed inside a slight cocoon, made in the "retreat" of the caterpillar, or some other convenient place for seclusion and shelter. The pupal period is about 11 days.

Omiodes monogona Meyr. Bean Leaf-roller (Plate II, fig. 11).

"♂ ♀, 26 mm. Head, palpi, antennae, and thorax fuscous, palpi white towards base beneath. Abdomen fuscous; segmental margins slenderly whitish. Legs ochreous-whitish, anterior pair infuscated. Fore wings elongate-triangular, costa arched posteriorly, apex obtuse, hind margin rather obliquely rounded; fuscous, irrorated with darker; a dark fuscous line from one-fourth of costa to one-third of inner margin, bent outwards in middle, preceded by some whitish scales; a blackish dot in disc at two-fifths, and a transverse-linear blackish mark beyond middle; a cloudy whitish line from two-thirds of costa to three-fifths of inner margin, thickest beneath, anteriorly suffusedly margined with dark fuscous, moderately curved outwards, below middle with an obtuse subtriangular projection inwards to below discal mark; a hind-marginal row of cloudy blackish-fuscous dots; cilia fuscous-whitish, with a fuscous line (imperfect). Hind wings fuscous; a dark fuscous transverse discal mark at one-third; a cloudy whitish almost straight line from three-fifths of costa to anal angle, anteriorly suffusedly margined with dark fuscous, and posteriorly followed by a broader dark suffusion; an interrupted blackish-fuscous hind-marginal line; cilia as in fore wings." [Meyrick, Trans. Ent. Soc. London, p. 216, 1888].

This species is common on Kauai, Oahu, Maui and Hawaii. The caterpillars feed upon *Erythrina monosperma* ("Wiliwili"), *Dolichos lablab*, and several species of wild beans with long twining vines in the woods of the mountains. I have also found them on garden beans in Honolulu. They fold over (or under) a portion of leaflet, and fasten with silk, or fasten two leaves together where their surfaces are in contact, and feed within, eating away the substance of the leaf and leaving the outer epidermis. Pupation takes place where the caterpillars have fed.

Caterpillar.—(Plate IV, figs. 6, 7). Length about 22 mm.; dark green, due to the contents of the alimentary tract, light yellowish green when the latter does not contain green plant substance. The head has the usual two large roundish black spots on the face, from each of these usually a black band extends obliquely to the periphery, beneath this and parallel to it is a shorter black band, not reaching the periphery; a black band extends from ocelli around the periphery, more or less interrupted on the vertex; two parallel short black bands in the middle of upper part of face; two dots a little above the clypeus, and a little higher are two very tiny dots; a tiny dot at postero-ventral angle of head; antennae black-tipped. Cervical shield more or

less completely and strongly black-margined, interrupted at middle posteriorly, in front broken into 8 or 10 dots; a few tiny dots near middle and a little in front of posterior margin; a longitudinal black bar in each lateral lobe, sometimes divided into two spots. Tubercles of all segments more or less black-margined, those of segment 3 usually most strongly margined, those of segments 4, 11 and 12 nearly as strongly margined. In younger stages the head has fewer markings, and the supra-spiracular lines of tubercles are entirely black.

Pupa.—Length 9 mm., medium brown, similar to *O. accepta*. Pupal period 11–13 days.

Omiodes epicentra Meyr.

"♂ ♀. 25-26 mm. Head, thorax, and abdomen whitish-ochreous mixed with brownish, segmental margins narrowly whitish, anal tuft mixed with dark fuscous. Palpi dark fuscous, lower half white. Fore wings moderate, termen bowed; pale ochreous, irregularly mixed with whitish and sprinkled with dark fuscous; veins indistinctly whitish; first line dark fuscous, very acutely angulated in middle, upper portion indistinct, lower strongly marked and followed by a brownish-ochreous suffusion; a blackish orbicular dot; two dark fuscous discal dots transversely placed, followed by an oblique brownish-ochreous suffusion; second line whitish, edged with dark fuscous, with very slight and obtuse angulation below middle; a terminal series of blackish triangular dots. Hind wings grey, darker-sprinkled; a blackish discal dot; a straight whitish postmedian line, edged anteriorly with dark fuscous, and posteriorly by ♀ cloudy dark fuscous suffusion; an interrupted blackish terminal line." [Meyrick, Fauna, Hawaiiensis, I, Pt. II, p. 203 1899].

This species has been collected quite abundantly in certain seasons, by Dr. Perkins, at Waialua and Waikiki, Oahu; but so far the caterpillars remain undiscovered.

Omiodes euryprora Meyr.

"♂ ♀. 31-33 mm. Head, thorax, and abdomen fuscous. Palpi dark fuscous, lower half white. Legs dark fuscous, tarsi white. Fore wing long, apex subacute, termen rather strongly sinuate; fuscous, pur-

plish-tinged, irregularly sprinkled with whitish, a sharply-defined blackish-fuscous very broad median band, not reaching costa, anteriorly edged by lower portion of faintly marked angulated first line, anterior half of upper edge excavated, with a blackish orbicular dot in middle of excavation, posterior edge margined by whitish second line, forming a strong obtuse prominence in middle; a terminal series of blackish-fuscous dots. Hindwings fuscous, darker posteriorly; an obscure paler post-median line, angulated in middle." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 202, 1899].

A very rare species. Dr. Perkins collected a few specimens at Hilo and Olaa, Hawaii. The caterpillars are unknown.

Omiodes telegrapha Meyr.

"♂. 40 mm. Head and thorax ochreous-yellowish. Palpi yellow-brownish, lower half whitish. Fore wings long, termen sinuate beneath subacute apex; light ochreous-yellowish, slightly blackish-sprinkled, veins partially white; first line very acutely angulated above middle, only indicated by several blackish dots between veins; second line cloudy, blackish, interrupted by veins, almost straight; an almost terminal series of blackish dots, preceded by white dashes. Hind wings grey, veins whitish; a dark grey discal dot; a straight whitish postmedian line, edged anteriorly narrowly, and posteriorly more broadly with dark grey suffusion; a terminal series of black dots preceded by white dashes." [Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 204, 1899].

The only specimen known was collected by Dr. Perkins, at Olaa, Hawaii. The caterpillars are unknown.

Hymenia recurvalis (Fabr.) (Plate II, fig. 12).

♂ ♀ 20–23 mm. Head pale lemon yellow, eyes and antennae brown; palpi pale lemon yellow, third joint and apical portion of second, in front, brown; thorax and abdomen fulvous brown, apical margins of abdominal segments ringed with white, that of 2nd abdominal segment much fainter than the others, that of 1st segment yellowish. Legs brownish white, middle tibiae pale yellowish on outside, anterior tarsi ringed with blackish. Forewings fulvous brown; a medial white band pointed in front but not reaching costa, outer edge irregular and toothed on vein 2; second line represented by a white band from costa to vein 5, a row of three white spots extending dorsally from the outer terminal angle of this band, situated between the veins 2 to 5 (sometimes that between veins 2 and 3 absent); cilia brown, darker at base, two white

spots one at vein 5 the other near anal angle. Hindwings fulvous brown, with oblique white medial band not quite reaching costa, and terminating near anal angle, narrowing at the dorsal part, this band as well as those of forewings are blackish bordered, that of the hindwing most distinctly; cilia white, dark brown at base, except a spot between veins 5 and 6, which is white to the base.

This species is closely related to our *Omiodes* species. It is a widely distributed species, occurring in Asia, Africa, and Australia. It is very abundant in the Hawaiian Islands. The caterpillars feed chiefly upon Pigweeds (one or more species of Euxolus, and *Portulaca oleracea*), often being so abundant as to entirely strip the leaves from these common weeds over large areas. They also feed upon garden beets, cockscomb, and other cultivated and wild plants or weeds of the Amarantaceae and Chenopodiaceae. The caterpillars feed on the under-side of the leaves protected by a slight web; being green, they are easily hidden, somewhat resembling ribs of the leaf. The moths are often so numerous in cane-fields where the above mentioned weeds are abundant, that they may be mistaken for cane leaf rollers, or other injurious moths.

Life History

The eggs are flattish oval about $\frac{2}{3}$ mm. by $\frac{1}{2}$ mm.; finely reticulated and somewhat wrinkled and of an iridescent greenish hue. They are deposited singly on the surface of a leaf, usually beside a rib or vein, or in a groove produced by a vein on upper surface of a leaf. They hatch in a few days, and the caterpillars are full grown in about two weeks.

Caterpillar.—(Plate IV, figs. 9, 10). Full-grown, 19 mm. long, tapering towards the ends, the head quite narrow compared with the middle of body; light green, turning rose-colored a day or two before spinning cocoon. The head has some faint brownish mottling, black ocelli, a tiny black dot on postero-ventral angle; cervical shield has faintly black lateral margin, a conspicuous black spot in each lateral lobe, a tiny dot behind each spot, anterior part of lateral lobe has brownish mottling similar to that on the head; two black spots on segment 3 larger than those of cervical shield, these are tubercles ii. The tubercles are arranged similarly but they are not so conspicuous as in *Omiodes*.

The pupa (Plate IV, fig. 11) is formed within a slight cocoon

in folded together piece of leaf. It is very pale brown, 10 mm.; wing- and antenna-cases reaching to posterior margin of 4th abdominal segment; spiracles of 4th abdominal segment slightly larger and surrounded by a swollen ring; cremaster short, with 8 long hooked spines fastened into the cocoon. Pupal period about 12 days.

* Table of species of *Omiodes*.

1	Forewings with veins marked by pale lines	2
	" " " not marked by pale lines	6
2	Second line with acute projection outwards	3
	" " without " " "	4
3	Forewings of male suffused with ferruginous	*meyricki*
	" " " not " " "	*blackburni*
4	First line indicated by dark shade	5
	" " " by dark dots only	*telegrapha*
5	Second line very obtusely angulated below middle	*epicentra*
	" " not angulated	*accepta*
6	Forewings ochreous or ferruginous	7
	" fuscous	8
7	Orbicular and discal spots well-marked	*demaratalis*
	" " " absent	*monogramma*
8	Hindwings with postmedian line angulated or bent in middle	9
	Hindwings with postmedian line almost straight	11
9	Median band of forewings darker	10
	" " " not darker	*localis*
10	Forewings with second line obsolete	*asaphombra*
	" " " sharply marked	*euryprora*
11	Postmedian line of hindwings white	12
	" " " not white	13
12	Second line of forewings projecting inwards below middle	*monogona*
	Second line of forewings without projection	*continuatalis*
13	First line followed by blackish streak	14
	" not so followed	*iridias*

*Adapted from Meyrick, Fauna Hawaiiensis, I, Pt. II, p. 201, 1899.

14 Blackish streak following first line, bent nearly at right angles ..... *anastrepta*
Blackish streak following first line, bent at very obtuse angle ..... *antidoxa*

Table for the Determination of the present known Caterpillars of the Genus *Omiodes* in Hawaii.
(Foodplants given in parenthesis).

1 (14) Each lobe of head with a roundish black spot near middle in front, a black spot including most of the eye-cluster; no other conspicuous spots on head.
2 (3) Lateral lobes of cervical shield not black-margined.
2a. Head yellowish, checkered with darker yellow (Sugar cane and grasses) ..... *accepta*
2b. Head pale green, not checkered (Banana) ... *meyrricki*
3 (2) Lateral lobes of cervical shield more or less black-margined.
4 (9) Tubercles of segments 5-11 not wholly or partially black-margined.
5 (6) Supra-spiracular tubercles of segment 12 black-margined only on upper and posterior sides, especially strongly marked posteriorly (Grasses) ..... *localis*
6 (5) Supra-spiracular tubercles of segment 12 margined nearly all around, not strongly marked posteriorly.
7 (8) Tubercles ii of segment 3 strongly black-margined all around, except on upper side (*Astelia veratroides*) ..... *iridias*
8 (7) Tubercles ii of segment 3 strongly marked only in front and below (*Astelia veratroides* silversword) ..... *asaphombra*
9 (4) Some of the tubercles of all segments more or less black-margined.
10 (11) Cervical shield not black-margined posteriorly (Grasses, especially "pili" grass) ..... *continuatalis*
11 (10) Cervical shield conspicuously black-margined posteriorly.
12 (13) Tubercles of segments 5–10 only partially blackened on margins (Grasses) ..... *demaratalis*.

13 (12) Tubercles of segments 5–10 almost completely black-margined *(Dianella odorata)*.....*monogramma.*

14 (1) Besides above mentioned spots, 4 or 5 other black spots on each lobe of the head.

15 (18) Lateral lobes of cervical shield not black-margined.

16 (17) Tubercle i of segment 3 very strongly black-marked anteriorly (Sedge: *Carex oahuensis)*.....*anastrepta.*

17 (16) Tubercle i of segment 3 not strongly black-marked (Sedge: *Rhyncospora thyrsoidea)*.....*antidoxa.*

18 (15) Lateral lobes of cervical shield strongly black-margined.

19 (20) The black eyespot has a considerable extension upward on side of head (Bean vines and "wiliwili" tree) .....*monogona.*

20 (19) No extension of the black eyespot upward on the side of head (Palms, especially coconut, and banana) .....*blackburni.*

REMEDIES.

Arsenical sprays such as Paris Green and Arsenate of Lead should be more or less effective against leaf-rollers when they become destructive. There would be great difficulty in applying these in cane fields, however, except in young fields where the cane has but a few months' growth, and small enough not to be broken down by a spraying cart. Of course it is in the younger cane the destruction by leaf-rollers will be greatest, as the amount of eating they would do on small shoots has greater effect in crippling it for further growth. Larger cane is better able to withstand some loss of leaves without any particular injury.

So far as I know, no trials have been made to determine how expensive, or how effective, the use of poisons may be in the control of this pest. At present, the natural enemies have made the damage by leaf-rollers less severe than in former years, as indicated by occasional reports of very serious injury by them in the past. But even with this usually efficient control by parasites, there may be times when certain fields of young cane appear to be becoming too seriously attacked by leaf-rollers, and spraying

could be profitably resorted to. In case this is attempted, a cart should be devised to be drawn by a team, and straddling one row, spray it and another row on either side. This might be readily done in unirrigated fields, but probably too difficult to accomplish in irrigated fields, on account of the crookedness of the rows of cane in conforming to the natural contour lines of the land.

Arsenate of lead would be the better poison to use, as it is easier retained in suspension in the water of the spraying cart; and it also adheres to the leaves permanently, even in rainy times; whereas Paris Green would wash off with the first shower. About 4lbs. of the Asenate to 100 gallons of water would be a good proportion to use. This should be effective against the Army worm and cut worms as well. They sometimes infest the fields of young cane at the same time the leaf-rollers do, though usually they are apt to be injurious to young cane at an earlier stage than it is attacked by the leaf-rollers.

A method which has been used at times is to go over the field row by row, and by hand, pinching all the "retreats" of the leaf-rollers that can be seen, thus destroying the caterpillar within. This could be accomplished without much additional labor at the time of hoeing, the laborers being properly instructed to look for the "retreats" which are usually conspicuous, when one knows what to look for, i. e., the portion of margin or tip of leaf rolled up into a tube on a portion of the leaf which has been more or less eaten away by the caterpillars.

Young palm trees may be easily relieved of the leaf-roller pest by frequent examination, and destroying the young caterpillars soon after they hatch, when they are feeding gregariously on the the surface of the leaf. The colony may be recognized by the web by which they are covered; and a stiff brush, or something similar, may be used to kill them at one stroke. After they have grown to a larger size and fastened together leaflets or folds of the leaf for hiding places, they may be killed by pinching together the folds with the fingers, continuing the pressure along the whole length of the fold of the leaf or leaflet. This is applicable to small trees only; after they have grown larger, beyond convenient access, nothing can be done to advantage. Spraying with poison is not feasible, as the caterpillars do so much of their feeding inside of folded leaves that the poison is not likely to be placed

where much of it will be eaten by them. Under these circumstances dependence has to be made upon the natural enemies, of which there are many. Of course it will be readily understood, that any method given above for the destruction of leaf-rollers, will also result in the destruction of whatever parasites may be infesting them at the time.

NATURAL ENEMIES.

Omiodes caterpillars are attacked by a large number of species of parasites, some of which are native, and several which are the most valuable have been introduced. The most of the species are kept in check by their natural enemies, so that they do not become very numerous; in fact, several of them are very rare. Two species feed so numerously on cultivated plants that they become serious pests: *accepta* on sugar cane, and *blackburni* on palms. These two species are preyed upon very extensively by the parasites and checked considerably, but not sufficiently to keep them from doing considerable injury in certain localities and at certain seasons. Apparently the moths are more prolific in the winter months (about December to March), and the parasites are scarcer owing to their having had fewer caterpillars for them to keep breeding on during the preceding summer. Hence, when the winter broods of caterpillars appear, there may be two or three generations of them before the parasites breed up to sufficient numbers so that they produce any noticeable check on the number of the caterpillars; then in another generation or two the caterpillars may be much reduced in numbers and a large percentage of them found to be parasitized; for example: on one occasion 75% of the cane leaf-rollers in a field at Hutchinson plantation, Hawaii, were found to be destroyed by one species of parasite; at Olaa plantation, Hawaii, in a certain field, on one occasion a much higher percentage of them than that were killed; in Honolulu, of a large number of the palm leaf-roller caterpillars collected, 90% were parasitized.

Since there are so many species of parasites preying on the leaf-rollers which are pests, it might be asked "Why do they not become exterminated, or at least cease to be pests?" Apparently, with all of the parasites, they are still not numerous enough to

over-balance the prolificness of the pest, even tho they do kill such high percentages of them at times. Since so many are killed by parasites, and yet there are enough left to do considerable injury at times, one can not help but wonder to what extent these pests might increase were there no parasites preying on them, and how many times more serious would be the damage done by them. The extreme difficulty and impracticability of treating sugar cane fields, or large palm trees, artifically, for the destruction of these pests, makes it all the more important that there are so many valuable parasites preying upon them; and shows the value of introducing natural enemies to control a pest, for the four best parasites of these leaf-rollers are introduced species, viz., *Macrodyctium omiodivorum*, *Chalcis obscurata*, *Frontina archippivora* and *Trichogramma pretiosa*.

Macrodyctium omiodivorum n. sp.* Omiodes Braconid (Plate V, fig. 1).

"Female:—Length 2-3.5 mm.; pale ochraceous with blackish areas, head and thorax often darker, rather pubescent. Head transverse, pale ochraceous; ocelli enclosed in a black area, which sometimes extends forward to the bases of the antennae; occipital area black. Antennae about equal in length to the entire insect, dark fuscous, paler at base, the scape sub-globose, not larger than the first joint of the flagellum, pedicel about as long as thick; number of joints variable, 26-28. Thorax finely punctate, pubescent, ferrugino-ochraceous or blackish, discal area often with a median blackish area produced to the thoracic foramen; parapsidal furrows not very distinct, very slightly convergent posteriorly. Meso- and metapleura ferruginous or blackish; metanotum, pre-scutellar suture, posterior margin of scutellum, post-scutellum and humeri blackish or even pitchy.

Abdomen ovate, rather convex, pale ochraceous; first segment trapezoidal, deeply impressed, raised laterally, with a median blackish area; the remaining segments smooth, except the second which has a small median tubercle basally, which is infuscate; each of the third, fourth and fifth segments has a median dark fuscous or blackish patch, the whole forming a large sub-quadrate area on the dorsum. Terebral sheaths short, less than one half the length of the abdomen, dark fuscous, pubescent. Legs moderately stout, pubescent, unicolorous, pale ochraceous, except the apex of the terminal tarsal joint and claws which are blackish; tibial spurs not large. Wings smoky, veins, costa and stigma

* Description by F. W. Terry.

dark fuscous; second abscissa much larger than the first and distinctly larger than the first transverse cubitus.

Male:—Very similar to the female though usually rather smaller and darker, the blackish areas more generally distributed over the head and thorax. Usually the ochraceous coloring becomes more ferruginous with the melanic forms of both sexes.

The above species agrees generally with Ashmead's *Macrodyctium*, although approaching *Myosoma* in the character of the pedicel."

This valuable Braconid is an introduced species. There is no definite record of it, but it was probably introduced by Mr. Koebele from Japan, in 1895, at the same time that he introduced *Chalcis obscurata*. It is now thoroughly established and very widely distributed in these islands. It is the most valuable of all the parasites on the cane leaf-roller (*Omiodes accepta*), and is found wherever the latter is abundant in the cane-fields.

In one field of Hutchinson Sugar Plantation, Kau, Hawaii, where there were a good many *O. accepta* caterpillars feeding on the cane leaves, a large number of the caterpillars were examined and by actual count 75% were dead, having been killed by this parasite. Many of the caterpillars had the larvae of the parasite feeding upon them; others were entirely dried up, the parasites having obtained their growth and spun cocoons in a cluster on the leaf close by. In a cane-field at Olaa, Hawaii, I found the leaf-rollers, tho abundant, nearly all killed by this parasite. Similar conditions I have found in many other sugar plantations. The larvae are entirely external feeders, and grow very rapidly, becoming full-grown before the caterpillar gets too much decomposed. I have found this parasite feeding very abundantly on a leaf-roller (*Cacoccia*, sp.) on Guava, at Kipahulu, Maui, and on the palm leaf-roller (*Omiodes blackburni*) in Honolulu. It probably will eventually parasitize many other species of leaf-rollers, attacking particularly whichever is most abundant in the paticular locality.

Life History

The female parasite most likely attacks the *Omiodes* larva within its "retreat," made of a piece of leaf rolled over. From the size of her ovipositor, one would expect that she would insert her eggs within the host; but so far as I have observed they are placed on the outside, (Plate V, fig. 2). The number of eggs

varies. I have seen 5 on one caterpillar; and the number of larvae which I have seen feeding upon one caterpillar varies from 1 to 23—probably all laid by the same female.

The adult parasite must sting the host caterpillar before laying its eggs, for the caterpillars have the habit of squirming very actively when disturbed, and falling to the ground.

The caterpillars always appear to be dead whenever found with parasites or their eggs, but probably they are only paralyzed by the sting of the parasite, as is done by certain wasps which store up caterpillars and spiders for food for their larvae. Often on examination of these apparently dead caterpillars which have parasite eggs or small larvae present, pulsations can be seen in the dorsal vessel.

The eggs are white, or slightly yellowish, $\frac{5}{8}$ mm. long. They hatch in a day or two, and the young larvae have a very rapid development. They are footless grubs, and feed externally (Plate V, fig. 3), biting into the caterpillar and consuming its juices. In one instance under observation, they had become full-grown (4 mm.) in three days, and begun spinning cocoons; cocoons were finished the next day; three days after, the pupae were formed; and after five more days the adults appeared. This gives the life cycle as 13 to 14 days. From this same lot another generation was bred to maturity in exactly 14 days.

The cocoons (Plate V, fig. 4) are made in a cluster on the surface of the cane leaf close by the dried up remains of the dead caterpillar. The pupa is whitish at first, but becomes black in a few days, before the adult is formed. The adults emerge by eating a round hole near one end of the cocoon.

Hyperparasite. (*Eurytoma* sp.)

In Dec., 1905, I bred 9 of this Chalcid from a cluster of *Macrodyctium* cocoons. This cluster of 10 cocoons was collected at Naalehu, Hawaii, on a sugar cane leaf where a cane leaf-roller had lived before being attacked by the parasite. After 16 days, 9 adults (7 females and 2 males) of this hyperparasite emerged—one per *Macrodyctium* cocoon. Dissection of the 10th cocoon, disclosed a dead adult *Macrodyctium*. I have collected this Chalcid from cane-fields in Hamakua, Hawaii; and in April, 1907, I bred quite a number from cocoons of *Macrodyctium*, collected from palm trees in Honolulu, where the larvae of *Macro-*

dyctium had been feeding upon the caterpillars of the palm leaf-roller. It is very probable that this Chalcid has a general distribution thruout the islands tho perhaps not generally abundant. It will be unfortunate if it increases in number so as to diminish the effectiveness of *Macrodyctium* on the cane leaf-roller, and palm leaf-roller.

Chelonus blackburni Cameron (Plate VI, fig. 1).

"♀. Length 2.4 to 2.5 mm. Black, half shining, covered with a close microscopic silky pubescence; the greater part of the scape of the antennae and the four folowing joints reddish testaceous; extreme apex of coxae, trochanters, apex and base of anterior femora, and the posterior knees, pale red; four anterior tibiae and tarsi pallid testaceous; hinder tibiae broadly annulated with white, the white ring being nearer the top than the bottom; tips of four anterior tarsi and the hinder pair fuscous; the greater part of the hinder metatarsus white; spurs white; basal third of abdomen white, except a blackish mark at extreme base; at the apex this white portion is rounded, and at its junction with the black colour passes into brown. Mandibles reddish. Antennae about the length of the body, 17-jointed, the seven apical joints thicker than the basal ones. Head finely punctured, the face covered with white hair. Mesonotum finely punctured. From the usual transverse ridge at the base of the scutellum there runs a central straight carina, and outside of this again are two curved outwardly, but it is only the second which reaches the edge of the thorax; these keels are united by fine cross-bars. Scutellum smooth, shining on basal half, apical half with longitudinal striations. Metathorax punctured, and with distinct coarse longitudinal striations, truncated at the apex, and with a minute tooth at each edge. Abdomen about the length of head and thorax, finely punctured, the punctures almost obsolete on the basal white portion. The second segment depressed in the centre, and produced at the sides into a leaf-like ridge, from the inner side of which runs an almost obsolete carina in the direction of the centre of the segment, but which is not reached. The union (apparent) of the second with the third segment is indicated by a fine transverse line. Wings hyaline, stigma, radial and cubital nervures fuscous; other nervures pale testaceous." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 359, 1901.]

This little Braconid is common in the Hawaiian Islands. Altho described from here, it also occurs in Australia, (Perkins). It is probably parasitic on a number of species of leaf-roller caterpillars; but I have bred it only from the caterpillars of *Hymenia recurvalis*, on which it is quite common, a few from *Homoeosoma humeralis*,

and the tobacco split-worm (*Phthorimaea operculella*). Of a lot of the former caterpillars collected in Honolulu for rearing, parasites bred out from 14%. Dr. Perkins has also bred this parasite from *Phlyctaenia despecta*.

The parasitized caterpillar spins its cocoon when only about half grown (tho it may be the same age as a normal full-grown unparasitized one), but it does not pupate. In a day or two the half grown larva of the parasite emerges from the caterpillar and feeds upon it externally, finishing it in a day or two (Plate VI, figs. 1a-d). When full grown it is a thick, yellowish-white grub about 5 mm. long, somewhat tapering towards the anterior end, which is curved ventrally. It spins a delicate white cocoon inside the host's cocoon. The pupa is about 3 mm. long, whitish, with brown eyes. Before changing to adult stage it turns black, except the base and venter of abdomen. They are adult in about 2 weeks from the time the host caterpillar spun its cocoon.

Echthromorpha maculipennis Holmgren. (Plate V, fig. 6).

"♀. Length 12 to 16 mm.; ovipositor about half the length of the abdomen, or a little less. Black, punctate, the abdomen, except the first segment which is smooth and shining, closer and more strongly punctate, the scutellum convexly elevated, nearly smooth, the postscutellum smooth, impunctate, but with two foveolae, the posterior face of the metathorax polished, impunctate, but with some faint, transverse aciculations towards sides, towards the base and the pleura strongly punctate. Mandibles toward base and the anterior femora beneath and toward apex, their tibiae and tips of tarsal joints rufous; rest of legs black. The head is transverse, thin antero-posteriorly, the temples being flat, not developed, the face above the insertion of the antennae concave, the basin being smooth, except some faint aciculations or wrinkles; below the antennae the face is feeble convex, sparsely punctate but shining; the clypeus is large, smooth, the labrum slightly exposed, yellowish; palpi yellowish; ocelli pale. The wings are hyaline, with a small black spot almost at the extreme apex of the front wings, the stigma and veins black, except the longitudinal veins at their origin, which are testaceous. The abdomen is similar to that in *Pimpla* (sens. str.), the dorsal segments 2 to 6 with a transverse impressed line at apex, which is more or less obsolete medially, and with segments 2 to 5 also with an oblique line on each side extending from the base to the apical transverse line, the apical portion of the segments beyond this line being smooth.

"♂. Length 7 to 14 mm. Agrees in every respect with the female, except that it is smoother, feebly, sparsely punctate, the antennae longer, the abdomen elongate, slender, the first and second segments polished, impunctate, while the following segments are also polished but with some sparse, feeble punctures." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 336, 1901.]

This large native Ichneumonid occurs on all the islands of the Hawaiian group. It is usually found in the forests of the mountains; but it also often occurs very abundant locally at lower elevations, preying upon palm leaf-roller (*Omiodes blackburni*), and *Plusia chalcites* when these caterpillars are abundant. Of a large number of pupae of the latter species, collected in Feb., 1907, 54% were parasitized by this parasite. Beside the above hosts, I have also reared this parasite from pupae of the cane leaf-roller (*Omiodes accepta*), *Cacoecia* sp., and the Kamehameha butterfly (*Vanessa tamehameha*). It no doubt parasitizes many species of moths, and is of great value in keeping these in check.

Life History

The eggs of this parasite are inserted in the pupa of its host. The female by her strong ovipositor pierces the folded or rolled-together leaf within which is the pupa of its host and inserts an egg within the pupa. I have observed them thus piercing the "retreats" of *O. accepta*, *O. blackburni*, and cocoons of *Plusia chalcites*. The egg soon hatches and as a footles grub consumes the juices of the pupa, and when full-grown spins a slight cocoon inside the pupa and in contact with its wall. Within this cocoon it pupates, and in about 8 days becomes matured and gnaws its way out at the anterior part of the pupa. It is an interesting fact that in the large number of specimens I have examined, the head of the pupa of the parasite is always towards the anterior end of the host pupa.

Pimpla hawaiiensis Cameron. (Plate V, fig. 5).

"♂ ♀. Length 5.5 to 10 mm.; ovipositor less than one-half the length of abdomen. Black; legs red, the anterior tibiae inclining to yellowish in front, the hind tibiae and tarsi black, the extreme base of hind tibiae and a broad band above the middle and the spurs white; the tips of four anterior tarsi black; extreme base of posterior testaceous. Antennae

scarcely as long as the thorax and abdomen united, stoutish, tapering towards the apex; inclining to brown on the lower side, covered with microscopic pile. Head as wide as the thorax, shining, impunctate, the face somewhat protuberant, covered sparsely with white hairs; front a little depressed above the antennae; clypeus clearly separated; maxillary palpi testaceous, labial fuscous. Thorax shining, impunctate, the mesonotum sparsely, sternum and metapleurae densely covered with longish white hair; metanotum without any keels, the thoracic spiracle oblong. Abdomen about double the length of the thorax, covered with a longish white pubescence; base of petiole excavated, the middle portion sparsely punctured; apical part shining, impunctate, separated from the part in front by being a little raised. The other segments (except the apical) are closely and rather strongly punctured; the second is longer than broad; the others to the seventh broader than long; the seventh is longer than broad; the eighth is narrowed gradually to the apex. The edges of the second segment are testaceous at base and apex. Wings hyaline, shorter than the thorax and abdomen; the nervures and stigma black; areolet 4-angled, angled on lower side; the lateral nervures uniting at top; the recurrent nervure angled a little above the middle." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 339, 1901.]

This Ichneumonid parasite was originally described from the Hawaiian Islands, and is generally distributed. It also occurs in Mexico. "It may have been accidentally introduced from there quite a number of years ago" (Perkins). It parasitizes Pyralid and Tortricid moths especially, and probably others. I have not bred it myself. Dr. Perkins bred it from Tortrix larvae from Mexico, and in these islands he has bred it from *Omiodes accepta*, *O. blackburni*, *Azinis hilarella*, and two species of Cacoecia. The habits and life history of this parasite are probably similar to *Echthromorpha maculipennis*, to which it is closely related.

Limnerium blackburni Cameron. (Plate VI, fig. 2).

"♀. Length 6 mm. Black; the mandibles, palpi, trochanters, knees and tibiae (except at base and apex), and the spurs, yellowish-white; femora and base and apex of anterior tibiae reddish; base of four posterior femora, base and apex of posterior tibiae, blackish; coxae and base of trochanters black; anterior tarsi fuscous; the base of the tarsal joints pale. Abdominal segments at junction white; ventral surface at base yellowish. Head, thorax, and coxae almost opaque, faintly punctured; covered with a white pubescence, which is especially long on the face. Abdomen semiopaque, very finely punctured; terebra as long as the four last segments together; base of petiole smooth, almost shining.

The three basal areolae of metanotum are less strongly punctured than the rest; the superior median areola small, distinct, semicircular, broader than long; posterior median triangular at base; from that it contracts slightly and ends above the middle of the metanotum, where there is another field longer and somewhat oval in form, which occupies the rest of the middle space; the posterior intermedian area is semiobsolete, small; spiracular, large, wider at base than at apex; at the base it becomes rounded and enlarged. Wings hyaline; areolet shortly stalked; stigma fuscous." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 357, 1901.]

In a series of 25 females and 43 males which I have examined, I am unable to distinguish, by Cameron's descriptions and tables, which are *hawaiiense*, and which are *blackburni*, or whether they are all the same species. None of them agree completely with either description; tho I can separate some of them by the distinctions he gives in the markings of the legs, yet I have variations between, and my specimens do not have corresponding differences in pubescence; whereas Cameron makes a difference in pubescence a strong point of distinction between the two species. His descriptions are from a single female in each case, which, from the variations in my series of specimens, I think very inadequate for definite descriptions of species; in fact, he himself says, "I am not sure that if we had a long series of each, it would be found that they were varieties of one species." If they are to be considered as one species, the name *L. blackburni* Cameron, being the earlier described, should have preference.

I have bred this native Ophionid parasite from several species of leaf-rollers: cane leaf-roller (*Omiodes accepta*), palm leaf-roller (*O. blackburni*), "Wiliwili" leaf-roller (*O. monogona*), *O. localis*, *Pyrausta constricta*, *Homoeosoma humeralis* and from two undetermined species of *Phlyctaenia*. I also bred quite a large series from the tobacco splitworm (*Phthorimaea operculella*) which was badly infesting tomato vines and fruit. Dr. Perkins has bred them also from *Cacoecia*, *Phlyctaenia despecta* and *P. stellata*. Probably many other species of the smaller Pyralids are parasitized by them. I have collected specimens in several districts of Hawaii, in Iao Valley, in Honolulu, and in the mountains near Honolulu. The larva of this parasite eventually kills the host caterpillar, when the latter has become about full-grown. It emerges and spins a compact, light brown, oblong cocoon on the leaf beside the remains of its host, within the rolled together leaf which the

caterpillar had for a hiding-place. The cocoon is of two layers; the outer one is slight, of brownish silk and closely encloses the inner one, which is strong and papery and blackish in color.

Sierola dichroma P., MSS.

This native Bethylid I have bred from a caterpillar of *Omiodes asaphombra*, in the mountains above Palolo, Oahu. The larvae feed on the exterior of the caterpillar which has been stung and paralyzed by the adult parasite. They grow rapidly, and having finished, spin cocoons in a mass near the remains of the caterpillar. In the instance above mentioned, 9 larvae fed upon one caterpillar, and they spun their cocoons obliquely side by side in a mass. They were light brown and the individual cocoons did not show conspicuously from the exterior of the mass.

There are several species of *Sierola* in the Hawaiian Islands. They are all probably parasitic on caterpillars. What appears to be *S. molokaiensis* I have bred from a species of Cacoeciid caterpillar which feeds on a native tree, *Myrsine*. Mr. Perkins has bred a species from a Tineid caterpillar which is related to the "bud worm" in sugar cane. I have taken a species of *Sierola* in the sugar cane of the Experiment Station grounds, under circumstances which indicated that it was parasite of the sugar cane "bud worm."

Chalcis obsurata Walker.

"Body, antennae and legs black, with the usual structure. Body convex. Head and thorax scabrous, dull. Antennae stout, nearly filiform. Prothorax about four times as broad as long. Sutures of the parapsides distinct. Abdomen smooth, shining, subsessile, with cinereous tomentum towards the tip. Femora yellow at the tips, hind femora minutely denticulate beneath. Tibiae yellow beneath, striped beneath with black; hind tibiae black at the base. Tarsi yellow, tips black. Wings cinereous; squamulae yellow; veins black; ulna about as long as the humerus, (Walker)." [Ashmead, Fauna Hawaiiensis, I, Pt. III, p. 307, 1901.]

This is our largest Chalcid. It was originally described from Japan, and also occurs in China. It was introduced to the

Hawaiian Islands by Mr. Koebele, in 1895, from Japan, and in 1896 from China. It quickly became established, and is now abundant thruout the group. It is a very valuable parasite upon Pyralids and some other moths. I have bred it from the pupae of the following moths, in most cases quite abundantly: sugar cane leaf-roller (*Omiodes accepta*), palm leaf-roller (*O. blackburni*), *Phlyctaenia despecta*, *P. stellata*, *P. nigrescens*, *Cacoecia* (two species), *Plusia chalcites*, Sida tortrix and Koa tortrix. They are always common in sugar cane fields where the cane leaf-rollers are abundant, and render good assistance in checking this pest. They are even more abundant on the palm leaf-roller.

Life History

This parasite attacks the pupa (perhaps the larva as well sometimes) of its host. I have often found the cocoons of its hosts with a hole gnawed in the enclosing leaf, and a puncture in the enclosed pupa where the parasite has inserted an egg. From these I have subsequently reared the adult parasite. The length of larval stage is as yet undetermined. It pupates inside the host pupa, without forming a cocoon; in about 9 days it emerges as an adult by gnawing a roundish hole usually towards the anterior part of the host pupa. There is great variation in size of adults of this species, depending on what its host has been. Those I have reared from the Sida tortrix were quite minute compared with large ones reared from *Plusia chalcites* and *Omiodes blackburni*, which are much larger hosts. I never have reared more than one from a single pupa, tho some of the larger pupae would furnish food enough for more than one parasite.

Trichogramma pretiosa, Riley.

"Length about 0.3 mm. Yellow, the eyes red, the wings hyaline. Head wider than the thorax; antennae 5-jointed, joints 3 and 4 in the ♀ forming an ovate mass and together shorter than joint 2; joint 5 large, thickened and very obliquely truncate; in the ♂ joints 3, 4 and 5 form a more or less distinct, elongate club, beset with long bristles. Hairs of the wings arranged in about fifteen lines. Abdomen not so wide as the thorax, but as long as the head and thorax together; in the ♀ the sides subparallel, apical joint suddenly narrowed to a point." [Riley, Can. Ent. XI, p. 161, 1879.]

This little Chalcid fly is a very valuable egg-parasite, occurring thruout the United States, from Canada to Texas, and from Massachusetts to Colorado. It has been reported as parasitizing very extensively the eggs of many species of moths, including the cotton worm (*Aletia argillacea*), cotton boll-worm (*Heliothis armigera*), zebra caterpillar (*Mamestra picta*), codlin moth (*Cydia pomonella*), and West Indian sugar cane borer (*Diatraea saccharalis*). It no doubt destroys the eggs of many other species as well.

What was undoubtedly this species, Mr. Koebele, in his notes for 1900, mentions as having become established on the eggs of the palm leaf-roller (*O. blackburni*), in Honolulu. Tho I find no record of it, yet he probably had introduced this parasite a year or two previously. It is now widely spread. I have bred it from palm leaf-roller eggs in Honolulu; quite abundantly from eggs of *O. meyricki*, a closely related species, whose caterpillars were feeding on banana leaves at an elevation of about 1500 feet at Honomu, Hawaii; and I have had parasitized eggs of the sugar cane leaf-roller (*Omiodes accepta*) fron Olaa and Kohala, Hawaii. It probably is preying upon the eggs of the cane leaf-roller wherever these are abundant thruout the islands. These eggs are difficult to find, and hence not often seen unless the cane is badly infested with leaf-rollers. On this account so little is definitely known of the distribution of this little parasite. They are so small that usually three of them obtain their full-growth within one *Omiodes* egg. They breed very rapidly, i. e., have a very short life cycle. I bred one generation of them in 10 days; and in the West Indies they have been observed to reach maturity in much less time than that.

To my knowledge, this is the only parasite on the eggs of Lepidoptera in the Hawaiian Islands.

Frontina archippivora (Williston). (Plate VI, fig. 4).

Williston, Scudder's Butterflies of New England, III, pl. LXXXIX, fig. 18, 1889.

I have bred a large number of Tachinid flies of medium size from leaf-rollers and cut-worms and other caterpillars. They appear to be all of the same species, and apparently do not differ

from a specimen of *Frontina archippivora* received from Mr. Van Dine, which had been identified for him by Mr. Coquilett of Washington, D. C. Van Dine bred quite a series of these flies from the pupae of cabbage butterfly (*Pieris rapae*); Mr. Terry has also bred them from the same host and from *scotorythra rara*. I have bred a few from *Omiodes accepta*, *Spodoptera exigua* and *S. mauritia*; quite abundantly from the Palm leaf-roller (*Omiodes blackburni*); and large numbers of them from cutworms: *Agrotis crinigera* and *Agrotis dislocata*. In one lot of *Leucania unipuncta* caterpillars collected in sugar cane-fields at Pahala, Hawaii, 27% were parasitized. In a lot of caterpillars of this same "army worm" collected in cane-field at Naalehu, Hawaii, 33⅓% were parasitized; in another lot collected in cane-field at Hamakuapoko, Maui, 70% were parasitized by this Tachinid. I also bred a lot of caterpillars of the Monarch butterfly (*Anosia plexippus*) which were feeding on wild milk-weed in the pastures at Pahala, Hawaii, and 21% of them were parasitized. I found 28% of the caterpillars of another butterfly (*Vanessa carduii*) collected near Diamond Head, Oahu, to be parasitized by these flies.

From the above it is seen that these flies are very abundant in these islands, and are of valuable service in checking many of the destructive caterpillars. This species is very widely distributed in the United States, where it is parasitic upon quite a large number of species of caterpillars. It was undoubtedly introduced from there, perhaps somewhat recently, but the date is not known.

The eggs of these Tachinid Flies are deposited upon the living caterpillars. They soon hatch and the young maggots enter the body of the caterpillar and feed upon its juices. They usually do not become full-grown until the caterpillar has also obtained its full-growth and ready to pupate; then the full-grown maggots emerge from their dead host and form smooth dark brown, rounded oblong puparia in the ground. When parasitic on the palm leaf-roller, I have often found the puparia formed within the spun-together leaves where the caterpillars lived, in one instance six in a single leaflet of coconut leaf. Sometimes the host does not die till after pupation, and then the maggots soon emerge as from the caterpillar. Apparently the rate of growth of the host caterpillar has something to do with determining whether the parasitic maggots emerge before the pupation of the host or

afterward. With the cutworms which are the larger caterpillars and are slower to reach full-growth, the maggots of the parasite become full-grown usually before their host does, and kill and emerge from it before pupation takes place. On the other hand, the smaller species of caterpillars, or those which are of more rapid growth, pupate before the parasitic maggots emerge from them. This is the case with *Pieris rapae* and *Vanessa cardui*. Another explanation may be, that in the case of these latter species, the eggs of the parasite are deposited upon the caterpillars when they are more nearly full-grown, and hence the young maggot has not yet reached a large enough size to interfere with the development of its host when the latter is ready to pupate; so it pupates, but soon thereafter the parasite becomes full-grown, consuming the juices of the pupa in doing so, and breaking an opening in the pupa-case, wriggles out and lets itself slowly down to the ground by a strand of slimy material which it excretes and sloughs off at the posterior end of body by its constant wriggling. One or two is the usual number of maggots per caterpillar; but there are sometimes more. I have obtained as many as five. When there are so many they do not have food enough, and produce stunted, undersized adult specimens.

Chaetogaedia monticola (Bigot).

Grimshaw, Fauna Hawaiiensis, III, Pt. I, p. 20, 1901.

This is a larger Tachinid, occurring thruout the group, usually from the lowlands up to 4,000 feet. It is also reported from California. I have bred it from several species of caterpillars, mostly cut worms, army worms, etc.: *Leucania unipuncta*, *Leucania pyrrhias*, *Agrotis dislocata*, *A. cinctipennis*, *Plusia chalcites*, *Scotorythra rara*, cane leaf-roller (*Omiodes accepa*), *Omiodes continuatalis*, *Phlyctaenia monticolans* and *Hymenia recurvalis*. Dr. Perkins has bred it also from the "Peelua" (*Spodoptera mauritia*) and the Hau moth (*Cosmophila sabulifera*). It has been bred by Mr. Giffard from a black army worm, which has lately appeared in quite large numbers on Tantalus and whose identity is at present unknown. Mr. Kirkaldy reports a pupa of the butterfly *Vanessa cardui* parasitized by this fly. It is thus seen

that this is a very valuable fly, as it is very abundant at times on some of the above hosts.

The maggots or larvae of this parasite feed within their living host caterpillars, but do not get their full-growth until after the caterpillar has pupated. I never have found more than one parasite per caterpillar, in this species. It does not escape from its host to form a puparium as the former species does; but forms its puparium within the pupa of its host, after having consumed all the juices of the latter. The puparium of this species differs from that of the former, in being larger, and in having two trilobed black protuberances on the posterior end, which is usually somewhat widened and blunt. The adult fly emerges in about 15 to 20 days after the pupation of its host. In two instances where the host pupa was opened in order to make observations on the maggot of the parasite, it was found that the adult fly emerged in 11 and 14 days, respectively, from the time its puparium was formed.

Odynerus nigripennis (Holmgren). (Plate VI, fig. 5.)

"Black, the wings infuscate, and with a blue (but not bright) iridescence. A small median spot behind the antennae, and another behind each eye, often flavous. Apex of clypeus depressed, and lightly emarginate. Mesothorax finely, but very densely rugosely-punctate, the punctures generally rather large in the ♂. Post-scutellum with a very distinct raised line (usually serrulate or spinulose) at the truncation. Propodeum rough with large, feebly impressed, punctures. Abdomen with the second segment not raised from the base; beneath, with a wide depression, but shallow, meeting the apices of the costae obliquely, the costae themselves more or less obsolete or indistinct." [Perkins, Fauna Hawaiiensis, I, Pt. I, p. 70, 1899.]

There are more than 100 species of wasps of the genus *Odynerus* which are peculiar to the Hawaiian Islands. This black species is one of the largest ones. It is distributed to all the islands from Oahu to Hawaii, and occurs from the coast up as high as 4,000 feet in the mountains. Like the other members of the genus, they store up caterpillars of medium sized Lepidoptera as food for their young. Their nests are made in hollow twigs or holes in trees, in holes in rocks, in burrows in earth banks, etc., according to what is convenient in the particular locality. A favorite

place is the nests of the mud wasp (*Pelopaeus caementarius*). I once found them occupying a deserted paper wasp nest (*Polistes*) attached to underside of leaf of fan palm. They take possession of the empty cells of mud wasp nest, which are somewhat too large for them, however, so they divide them into two by a transverse partition of mud. They first put the desired number of caterpillars in the bottom of the cell, having paralyzed them by stinging them in ventral side, deposit an egg, then put in the mud partition, and fill up the outer part of the cell similarly, and seal up the opening with mud. When they use holes in rocks they are apt to use a hole about the proper size to hold caterpillars sufficient for one wasp larva to feed upon, and seal the opening with mud. In burrows in earth, or in hollow sticks, they may have several cells end to end.

The caterpillars which this species gathers are usually about an inch long, and they usually gather all one species for one cell, tho sometimes I have found them mixed. The number of caterpillars stored in one cell varies from 6 to 12. There is great variation in the size of the adult wasps, which is evidently due to the amount of food it had when a larva, i. e., the number of caterpillars which had been stored for it to feed on.

In many nests examined, the following species of caterpillars (all leaf-rollers) were found: *Omiodes accepta* (Cane Leaf-roller), *O. localis*, *O. monogona*, *O. blackburni*, *Hymenia recurvalis*, *Cacoecia*, sp., *Mecyna aurora*. These observations were taken at various places on Oahu, Maui and Hawaii. The species of caterpillar found in each case, was in accordance with the proximity to a place where there was an abundance of this particular species of caterpillar. When in the vicinity of sugar cane-fields where cane leaf-rollers are abundant, they capture a good many of these. Among the other caterpillars, those of the genus *Cacoecia* are collected in largest numbers. There are two species of these and they are leaf-rollers on almost every kind of tree, shrub and plant, planted or growing wild in the lower parts of the islands. The next most abundant caterpillar collected was *Hymenia recurvalis*, which is abundant on weeds of the Amarantaceae, on Purslane, and often on Beets.

Life History

The egg is white, elongate, 2.5 mm. long, and suspended from the upper side of the cell by a filament of about the same length. One egg is placed in each cell of stored up caterpillars. The egg hatches in but a few days, and the whitish larva at once begins eating its food-supply of caterpillars. It grows rapidly, finishing its food-supply and becoming full grown in 5 to 7 days. It is then a fat, footless grub (Plate VI, fig. 5a) about 15 to 17 mm. long and 5 mm. thick, curved ventrally. In a day or two it spins a layer of whitish silk over the inner surface of the cell, not making a regular, close-fitting cocoon.

Pupation soon takes place. The pupa (Plate VI, fig. 5b) is white for several days; finally it gradually turns black a few days before it becomes adult. The pupal period is about 15 days. At times they may pass long periods of time as full-grown larvae in their cells before pupation, probably a provision to enable them to survive long periods of drought in some of the drier regions. I found such a larva in a mud wasp's nest, June 5th, 1906. It remained in this condition in a tube in the laboratory of the experiment station till Dec. 9th, 1906, when it pupated. This was a period of a little over 6 months as a full-grown larva, and there is no knowing how long it had been in this condition when discovered. Pupation took place after a period of about 2 weeks of rainy weather with "Kona" storms. It remained in pupal stage 18 days, when the adult was fully developed.

Parasite (*Ageniaspis* sp?) (Plate VI, fig. 6)

Unfortunately the good work of *Odynerus nigripennis* is much checked by reason of its being parasitized by a very small Chalcid Fly. This parasite I have found widely distributed on Hawaii, Maui and Oahu. In a number of instances I have bred them from *O. nigripennis* larvae; and much oftener have found in *nigripennis* nests the empty larval skin from which the parasites emerged. The *nigripennis* larvae are allowed to become full-grown; the numerous tiny larvae of the parasite feeding inside, and pupate shortly after the host larva is full-grown. They completely fill the latter and can be seen through the transparent skin, packed so close that the skin has bulges where it conforms

to the pupae inside. I have bred 105 parasites from one wasp larva. They escape from the mud cell of the wasp by gnawing a tiny hole through the plug of mud which sealed it.

Polistes aurifer Saus.
Polistes hebraeus Fab.
Polistes macaensis Fab.

Fauna Hawaiiensis, I, Pt. I, pp. 29, 30, 1899.

These three species of wasps are very common thruout the islands. They are commonly known as "yellow jackets," and build paper nests under eaves, etc., of buildings, and also other sheltered places. They are very common in cane fields, in search of "honey dew." They also catch leaf-rollers to some extent. They appear to skin the caterpillar, chewing up the outer muscular body-walls into a pulpy mass to carry away to their nests to feed their young.

Xiphidium varipenne Swezey.

Swezey, H. S. P. A. Exp. Station, Ent., I, Pt. 7, p. 212, 1905.

This very abundant grasshopper, which preys upon the cane leaf-hoppers, I have also observed feeding upon cane leaf-rollers *(Omiodes accepta)* in cane-fields. It probably feeds upon other, grass-feeding *Omiodes* as well.

Oechalia griseus, Burm.

Fauna Hawaiiensis, III, Pt. II, p. 171, 1902.

This large native predaceous bug, I have seen in a few cases feeding upon cane leaf-rollers (*Omiodes accepta*). It was in cane-fields of elevated parts of plantations where they were near to native forests where this bug lives.

Planarian Worm.

I have observed an introduced worm feeding upon leaf-rollers in the mountains of Oahu. They attacked the caterpillars within their retreats. I observed them feeding on *Omiodes accepta*, *Omiodes asaphombra* and *Omiodes monogramma*. No doubt they feed on other species as well. I have found this worm beneath leaf-sheaths of cane at the Experiment Station grounds, where it probably had fed on larvae of bud moth or some dipterous larvae.

Table of the parasites of Omiodes, so far as they are known.

HOST	PARASITES
Omiodes accepta	*Macrodyctium omiodivorum*
	Echthromorpha maculipennis
	Pimpla hawaiiensis
	Limnerium blackburni
	Chalcis obscurata
	Trichogramma pretiosa
	Frontina archippivora
	Chaetogaedia monticola
Omiodes localis	*Limnerium blackburni*
Omiodes demaratalis	No parasites bred
Omiodes continuatalis	*Chaetogaedia monticola*
Omiodes anastrepta	No parasites bred
Omiodes antidoxa	" " "
Omiodes monogramma	" " "
Omiodes iridias	" " "
Omiodes asaphombra	*Sierola dichroma*
Omiodes blackburni	*Macrodyctium omiodivorum*
	Echthromorpha maculipennis
	Pimpla hawaiiensis
	Limnerium blackburni
	Chalcis obscurata
	Trichogramma pretiosa
	Frontina archippivora

HOST	PARASITES
Omiodes meyricki	*Trichogramma pretiosa*
Omiodes monogona	*Limnerium blackburni*
Omiodes epicentra	Younger stages unknown
Omiodes euryprora	" " "
Omiodes telegrapha	" " "

Table of parasites and their hosts.

PARASITE	HOSTS
Macrodyctium omiodivorum	*Omiodes accepta*
	O. blackburni
	Cacoecia sp.
Chelonus blackburni	*Hymenia recurvalis*
	Phlyctaenia despecta
	Homoeosoma humeralis
	Phthorimaca operculella
Echthromorpha maculipennis	*Omiodes accepta*
	O. blackburni
	Plusia chalcites
	Cacoecia sp.
	Vanessa tamehameha
Pimpla hawaiiensis	*Omiodes accepta*
	O. blackburni
	Cocoecia, 2 species
	Tortrix sp.
	Azinis hilarella
Limnerium blackburni	*Omiodes accepta*
	O. blackburni
	O. monogona
	O. localis
	Phlyctaenia despecta
	" *stellata*
	Pyrausta constricta
	Homocosoma humeralis
	Cacoecia sp.
	Phthorimaca operculella

PARASITE	HOSTS
Sierola dichroma	*Omiodes asaphombra*
Chalcis obscurata	*Omiodes accepta*
	O. blackburni
	Phlyctaenia despecta
	P. stellata
	P. nigrescens
	Cacoecia, 2 species
	Tortrix, 2 species
	Plusia chalcites
Trichogramma pretiosa	*Omiodes accepta*
	O. blackburni
	O. meyricki (In U. S. A.)
	Aletia argillacea
	Heliothis armigera
	Mamestra picta
	Cydia pomonella
	Diatraea saccharalis
Frontina archippivora	*Pieris rapae*
	Anosia plexippus
	Vanessa cardui
	Leucania unipuncta
	Agrotis dislocata
	A. crinigera
	Spodoptera mauritia
	S. exigua
	Scotorythra rara
	Omiodes accepta
	O. blackburni
Chaetogaedia monticola	*Leucania unipuncta*
	L. pyrrhias
	Agrotis dislocata
	A. cinctipennis
	Spodoptera mauritia
	Noctuid, species undetermined
	Plusia chalcites
	Cosmophila sabulifera

PARASITE	HOSTS
Chaetogaedia monticola	*Scotorythra rara*
	Omiodes accepta
	O. continuatalis
	Phlyctaenia monticolans
	Hymenia recurvalis
	Vanessa cardui

EXPLANATION OF PLATES.

Except where otherwise given the magnification of each figure is given with its number on the Plate; thus: 1x2.

Plate I.

All figures are of the Sugar Cane Leaf-Roller (*Omiodes accepta*).

1. Adult moth.
2. Caterpillar, side view.
3. " dorsal view.
4. " 4 anterior segments.
5. " front view of head.
   e, eye cluster.
   c, cervical shield.
   s, spiracles.
   d, dorsal row of tubercles. (In fig. 4=posterior trapezoidal).
   sp, supra-spiracular row of tubercles.
   sb, sub-spiracular row of tubercles.
6. Pupa, side view.
   e, eye.
   a, antenna-case.
   l, leg-case.
   w, wing-case.
   s, spiracles.
   c, cremaster.
7. Apex of cremaster, showing the curled spines by which the pupa is fastened to the cocoon.
8. Cluster of 4 eggs in groove on surface of leaf.
9. Eggs more highly enlarged.
10. Leaf spun together for "retreat" or hiding place of caterpillar; shows where caterpillar has eaten, (Nat. size.)
11. Leaf, showing spots where a very young caterpillar has eaten, leaving one epidermis intact, instead of eating holes thru the leaf, (Nat. size.)

Plate II.

1. *Omiodes localis.*
2. *O. continuatalis.*
3. *O. demaratalis.*

4. *O. epicentra.*
5. *O. asaphombra.*
6. *O. iridias.*
7. *O. anastrepta.*
8. *O. antidoxa.*
9. *O. monogramma.*
10. *O. blackburni.*
11. *O. monogona.*
12. *Hymenia recurvalis.*

Plate III.

Side view of head and three anterior segments, and front view of head of caterpillars, to show markings peculiar to each species.

1. *Omiodes asaphombra.*
2. *O. iridias.*
3. *O. localis.*
4. *O. demaratalis.*
5. *O. anastrepta.*
6. *O. antidoxa.*
7. *O. monogramma.*

Plate IV.

1. *Omiodes continuatalis*, lateral view of 4 anterior segments of caterpillar.
2. " " front view of head of same.
3. " " dorsal view of 3 posterior segments.
4. *O. blackburni*, lateral view of 4 anterior segments of caterpillar.
5. " " front view of head of same.
6. *O. monogona*, lateral view of 4 anterior segments of caterpillar.
7. " " front view of head of same.
8. " " egg on under surface of leaf.
9. *Hymenia recurvalis*, lateral view of 4 anterior segments of caterpillar.
10. " " front view of head of same.
11. " " pupa.

PLATE V.

1. *Macrodyctium Omiodivorum.*
2. " eggs on surface of caterpillar of *Omiodes accepta.*
3. " 5 larvae feeding on outside of caterpillar of *Omiodes accepta.*
4. " 9 cocoons on cane leaf near the dried remains of a caterpillar upon which the larvae fed. The holes in cocoons are where the adult parasites gnawed out. All were inside a " retreat " of *Omiodes accepta*, which has been opened, (Nat. size).
5. *Pimpla hawaiiensis.*
6. *Echthromorpha maculipennis.*

PLATE VI.

1. *Chelonus blackburni*, adult.
1a. " " full-grown larva, finishing the eating of a caterpillar, (x 10).
1b, 1c, 1d, Cocoons of *Hymenia recurvalis*; (Nat. size).
1c, contains normal sized caterpillar.
1b, contains dwarfed caterpillar due to parasitization by *Chelonus.*
1d, contains full-grown larva of *C. blackburni*, which has consumed the caterpillar of *H. recurvalis* and is now beginning to spin its own cocoon.
2. *Limnerium blackburni.*
3. *Chalcis obscurata.*
4. *Frontina archippivora.*
5. *Odynerus nigripennis.*
5a. " " larva.
5b. " " pupa.
6. *Ageniaspis* sp.

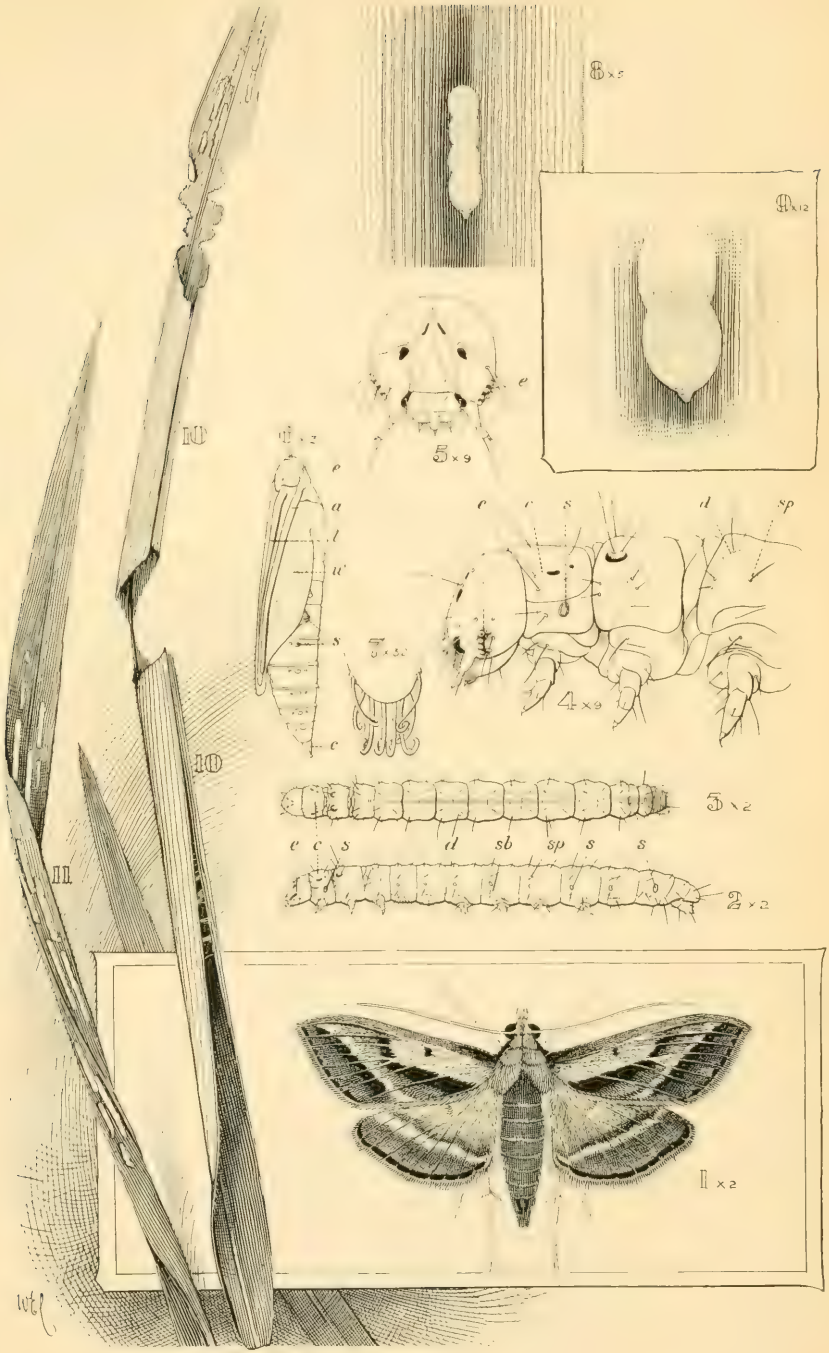

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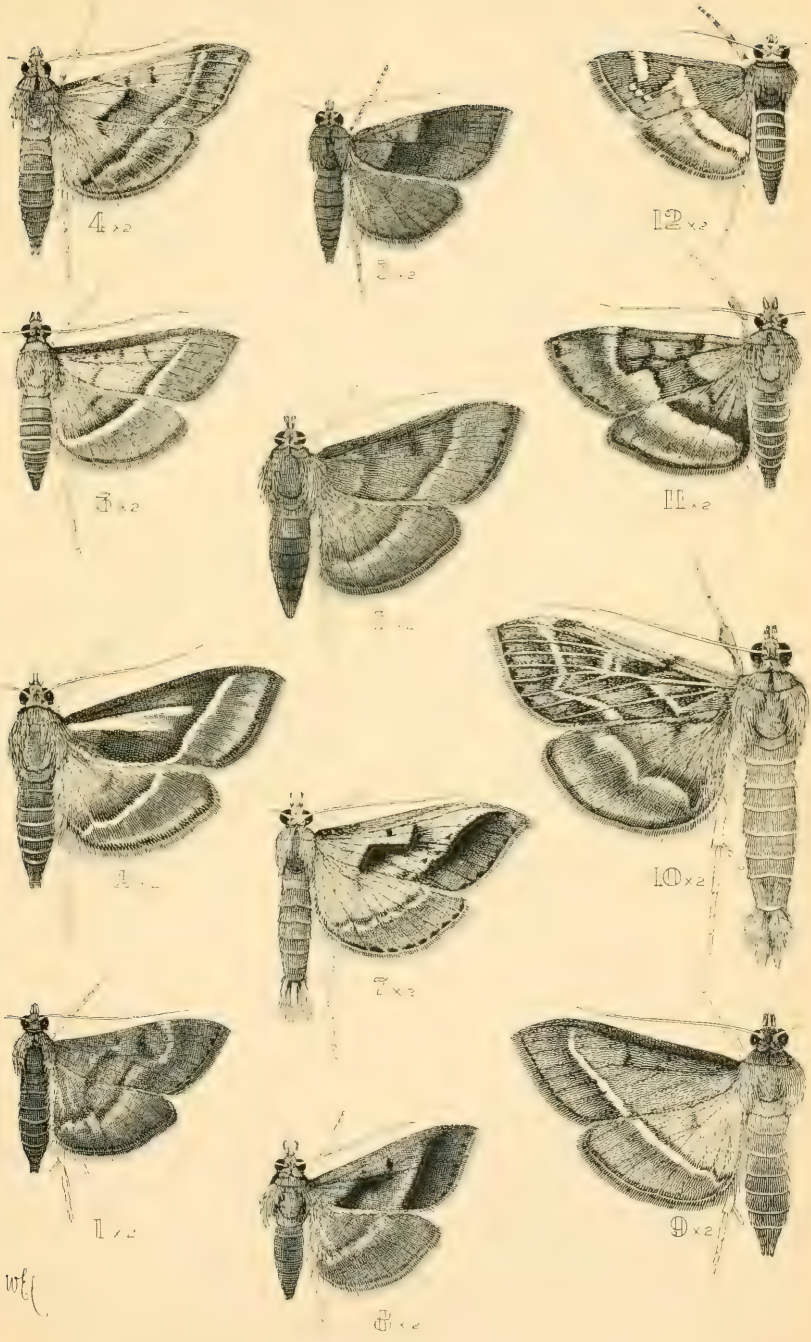
PLATE I.



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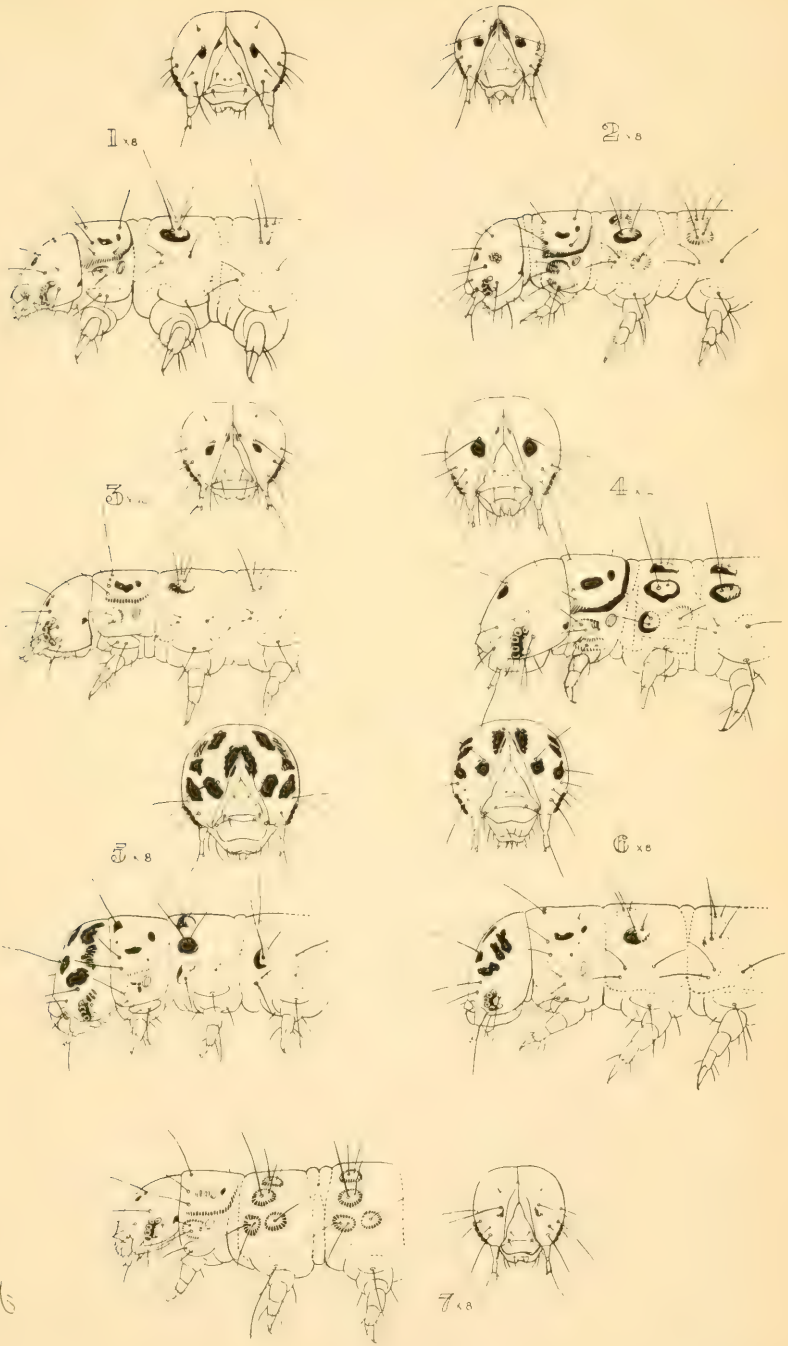

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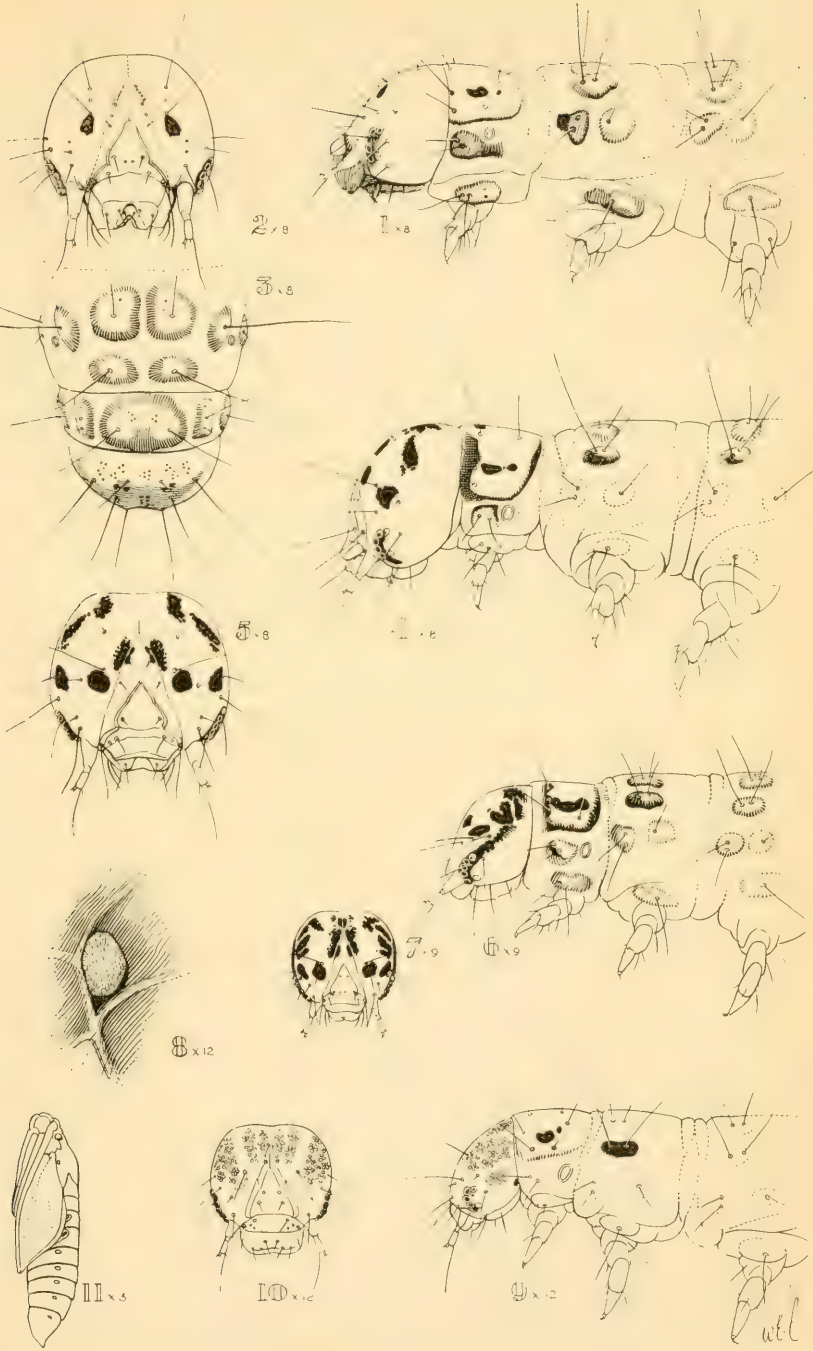

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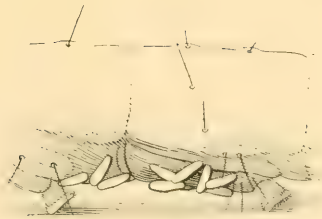

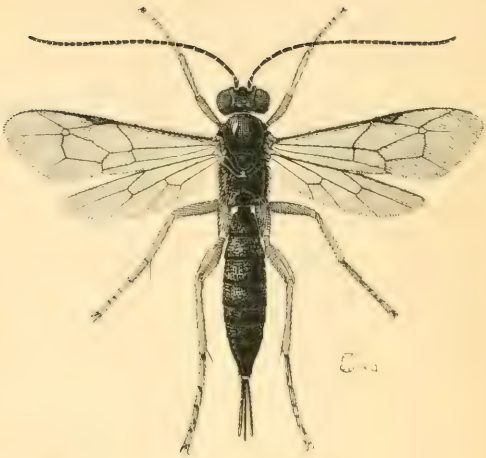

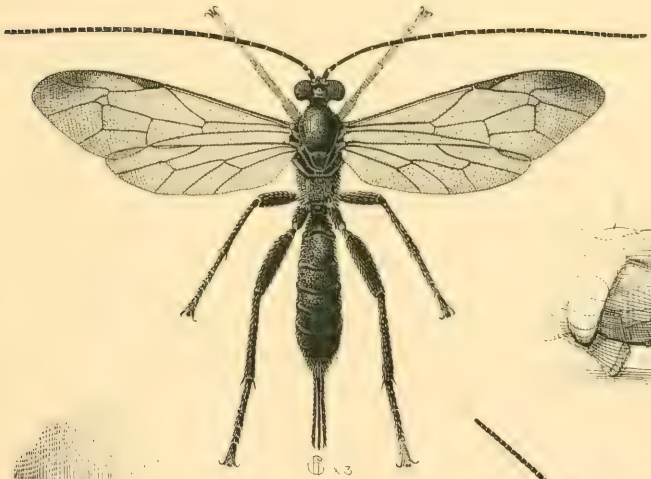

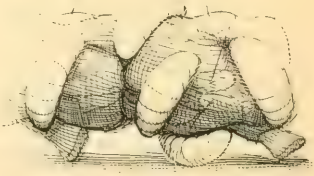

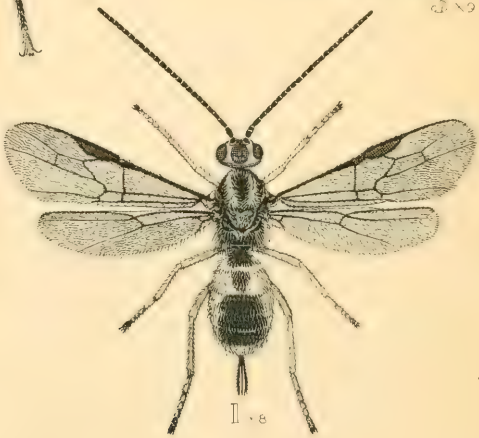

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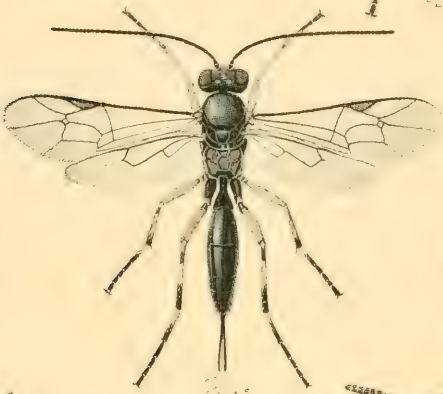

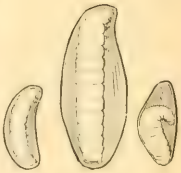

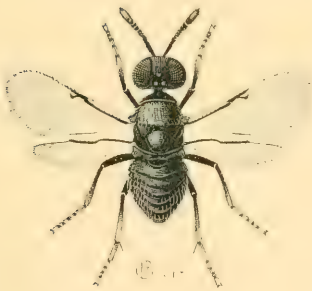

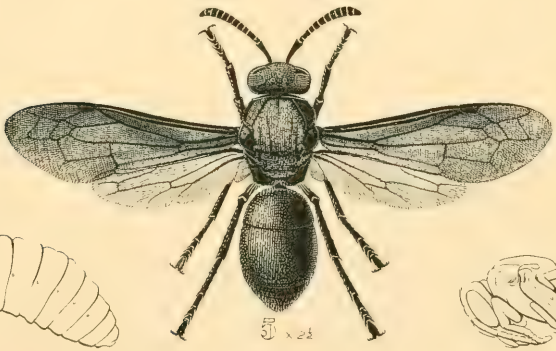

PLATE VI

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ERRATA

Page 6, line 6, for "*monograma*" read "*monogramma.*"
Page 18, line 32, for "these" read "there."
Page 20, line 38, for "family" read "faintly."
Page 26, line 6, for "*Tricogramma*" read "*Trichogramma.*"
Page 45 line 23, for "*obsurata*" read "*obscurata.*"
Page 48, line 18, for "*carduii*" read "*cardui.*"

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